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September 16, 1960
Vol. 34, No. 3

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Spray-in-place Shelters

Development of High Temperature Die Materials (Hot Die Materials)

The Explosive Working of Metals

Heat Transfer Efficiency of Automotive Engine Coolants

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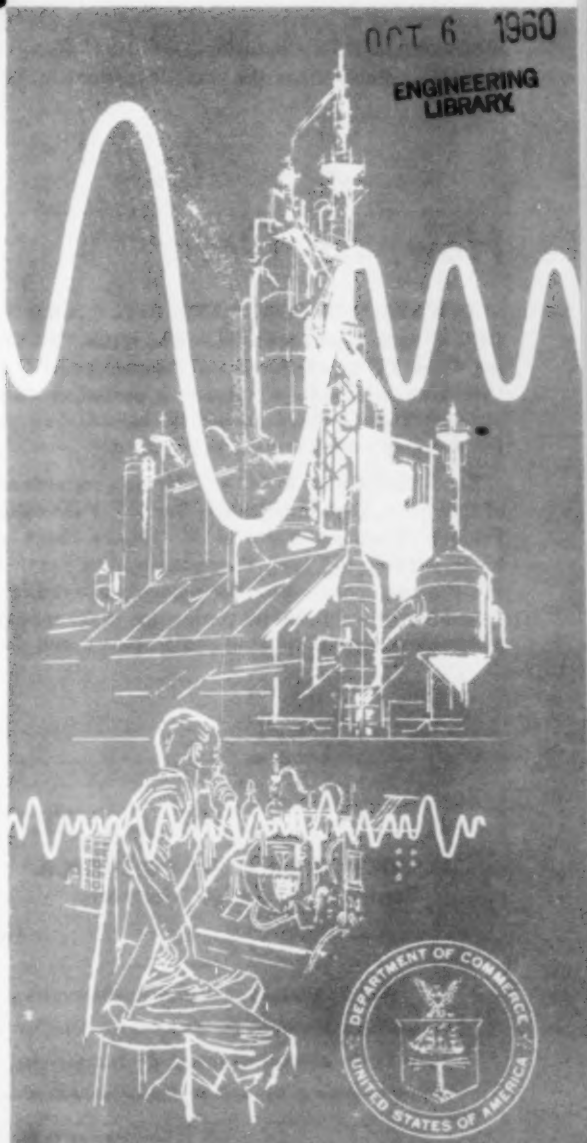

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Vol. 34, No. 3 Pages 249 - 366 September 16, 1960

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GENERAL RESEARCH PUBLICATIONS AND PRESENTATIONS, 1958. June 59, 29p. 64 refs.
LMSD-49753.
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A list of papers in the following categories: gas dynamics, aerothermodynamics, structures and mechanics, nuclear physics, radiation physics, magnetohydrodynamics, space physics, propulsion chemistry, materials, electrochemistry, solid state, electromagnetic propagation, electrical communications, acoustics and instrumentation, applied mathematics, and logical design.

ASTRONOMY

High Altitude Observatory, Boulder, Colo.
CLIMAX CORONAL INTENSITIES, DECEMBER 12, 1941-MAY 21, 1944, by Donald E. Billings. Technical rept. no. 4 on Contract DA 23-072-ORD-929.
3 Sep 57, 53p. 3 refs. Rept. no. HAO-37; OOR rept. 1482.4; AD-153 815.
Order from LC mi$3.60, ph$9.30 PB 147 863

The coronal spectrograms were only partially analyzed at the time the observations were made. Subsequent studies of solar geomagnetic relationships and of long-term coronal changes made the analysis of these plates very desirable. Since the plates contained no photometric calibrations, it was necessary to devise means of extracting a calibration from the Fraunhofer lines, and using this calibration to translate photographic blackenings into intensities at each position angle around the solar limb. The table of coronal intensities thus obtained is submitted. (Author)

Warner and Swasey Observatory, Cleveland, Ohio.
RED STARS IN YOUNG STELLAR CONFIGURATIONS, by Victor M. Blanco. Final rept. on Contract Nonr-2545(00). 30 June 59, 3p.
Order from LC mi$1.80, ph$1.80 PB 146 282

Astrophysics

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
EXTENSIVE AIR SHOWERS AT SEA LEVEL, by Frank Sherb. Technical rept. no. 71 on Contract Nonr-1841(16) and National Science Foundation Grants G2055 and G3006. 31 Aug 59, 87p. 17 refs.
Order from LC mi$4.80, ph$13.80 PB 147 714

This thesis describes an experiment directed primarily at the determination of some properties of cosmic ray primary particles with energies greater than 10^{15}ev. In addition, some information has been obtained on high-energy nuclear cascades.

Maryland U., College Park.
PRESENT STATUS OF THE EARTH'S RADIATION BELT, by S. F. Singer. Scientific rept. no. 3 on Contracts AF 49(638)630 and AF 19(604)5575. Sep 59, 9p. 2 refs. Technical rept. no. 155; AFCRC-TN-59-766; AFOSR-TN-59-1029; AD-227 260.
Order from LC mi$1.80, ph$1.80 PB 146 274

From theoretical considerations one expects to find two belts of trapped radiation around the earth. The following table, first presented by the writer in November 1958 at the San Antonio Symposium on the Physics and Medicine of Space, (in press, John Wiley and Sons, New York), lists the principal characteristics. These predictions have now been well supported by observations in satellites and space probes.

Rome Air Development Center, Griffiss AFB, N. Y.
ON THE POSSIBILITY OF SPACE SURVEILLANCE BY UTILIZATION OF SOLAR R-F ENERGY, by Joel S. Greenberg. Apr 60, 15p. 5 refs. RADC-TN-60-55.
Order from LC mi$2.40, ph$3.30 PB 147 514

The sun is a powerful transmitter which radiates a portion of its energy in the radio-frequency portion of the spectrum. The question naturally arises as to whether sufficient energy in the r-f portion of the spectrum is available from the sun so as to utilize the sun as a free transmitter in a space surveillance environment. This report discusses the possibility of utilizing the solar radiation for space surveillance; in particular, an analysis is performed for the conditions of noncoherent and coherent radiation, and the range capabilities for these two conditions are determined. (Author)

BEHAVIORAL SCIENCES

Human Engineering

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
MANUAL APPLICATION OF IMPULSES WHILE TRACTIONLESS, by Ernest Dzendolet. Rept. on Human Performance on Advanced Systems. Feb 60, 16p. 3 refs. WADD Technical rept. 60-129.
Order from OTS $0.50 PB 161 804

The percentage of naive subjects who, while tractionless in a horizontal plane and anchored by one handhold, push in or pull out a plunger in one motion against various frictional forces and travel distances, decreases directly as the force and distance required. With large-force impulses, the impulse is linear and the situation can be described by the impulse-memementum theorem: $\int_0^t F dt = mv_1 - mv_0$. The shape of the impulse is saw-toothed, and its area approximated by taking three-fourths of the area of a rectangle whose base is the duration, and height, the force of the impulse. For this experiment, the maximum duration of an effective impulse for a required force of 40 pounds is 0.5 seconds for a push-in, and 0.3 seconds for a pull-out impulse. A subject, without a handhold, can seat the plunger with a push, and, in spite of the reaction to the impulse, remain attached to the equipment without unseating it. The technique is to allow the reaction to move the subject over as long a distance as possible and, since the total impulse is constant, thus reduce the force. The reduction in force allows the equipment to remain seated since the force is now less than the frictional force needed for seating. (Author)

Aerospace Medical Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
WALKING UNDER ZERO-GRAVITY CONDITIONS, by John C. Simons. Rept. on Human Engineering Design Criteria for Space Vehicles. Oct 59, 12p. 3 refs. WADC Technical note 59-327; AD-232 469.
Order from OTS $0.50 PB 161 814

Army Ordnance Human Engineering Labs., Aberdeen Proving Ground, Md.
STUDIES ON THE KINETIC DEPTH EFFECT AS A MEANS FOR PRESENTING THREE DIMENSIONAL INFORMATION. I. METHODOLOGY AND SELECTION OF FORMS FOR STUDY, by Charles Fried. Mar 60, 38p. 28 refs. Technical memo. 2-60.
Order from LC mi$3.00, ph$6.00 PB 146 160

In an introductory study on the Kinetic Depth Effect, twelve stationary shadow projections of each of nine forms were presented to ten subjects to determine which forms appeared flat or two dimensional and which appeared three dimensional. This study was done to select from the nine forms a small group, all of whose shadow projections would appear as two dimensional. The only forms that appeared two dimensional to all subjects in each of their twelve shadow projections were the wire rod and the helix. The helix on examination was revealed to undergo substantially the same changes as the wire rod. A historical account of the Kinetic Depth Effect illusion and its pertinence for three dimensional displays is presented. (Author)

Electronic Research Lab., Northeastern U., Boston, Mass.
DIGITAL SIMULATION STUDY OF GAME-THEORETIC MODELS OF AN AIR TRAFFIC CONTROL SYSTEM, by John E. Letson. Scientific rept. no. 4 on Contract AF 19(604)4573. 21 Apr 60, 78p. 33 refs. AFCRC-TN-60-384.
Order from LC mi$4.50, ph$12.30 PB 147 664

A generalized large-scale, complex system is analyzed. The relation of the man-machine unit to the overall system response is considered. A particular system is established so that the effect of various strategies in a game theoretic sense might be evaluated. A study of the human decision process if the man-machine unit is discussed and graphs indicating the behavior of this operator, given certain conditions, are shown.

Stanford Research Inst., Menlo Park, Calif.
HUMAN ENGINEERING TESTING AND MALFUNCTION DATA COLLECTION IN WEAPON SYSTEM TEST PROGRAMS, by Albert Shapero, Joel I. Cooper and others. Rept. on A Method for Performing Human Engineering Analysis of Missile Systems, Contract AF 33(616)5688. Feb 60, 52p. 2 refs. WADD Technical rept. 60-36.
Order from OTS $1.50 PB 161 832

An examination was made into the frequency of human error in nine Air Force missile systems. It was discovered that human error contributed significantly (20% to 53%) to system unreliability, and that present malfunction reporting procedures are inadequate. Systematic approaches to the conduct of human engineering performance testing and the collection of adequate human-initiated malfunction data are outlined. (Author)

Personnel and Training

American Inst. for Research, Pittsburgh, Pa.
A SURVEY TO DETERMINE INDOCTRINATION NEEDS FOR PERSONNEL AT ISOLATED ARCTIC SITES, by Leo R. Eibert. Jan 59, 24p. 2 refs. Technical note AAL-TN-59-2; AD-230 842.
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Contents:
Survey procedures and findings
Attitude toward the assignment
Conditions associated with attitude change
Information and rumors
Adjustment problems
Making the tour easier and more pleasant
Implications for indoctrination
Indoctrination courses
Familiarization training unit
Motivation training unit
Supplementary indoctrination needs

Harvard Graduate School of Education, Cambridge, Mass.
VOCATIONAL DEVELOPMENT, THE ELECTION OF A SECONDARY SCHOOL CURRICULUM, AND PUBLIC POLICY, by John C. Cass and David V. Tiedeman. Rept. no. 13 on Harvard Studies in Career Development, Technical rept. no. 9 on Contract Nonr-1866(31). Aug 59, 25p. 17 refs. AD-226 732.
Order from LC mi$2.70, ph$4.80 PB 147 715

The correlation of scholastic ability with college attendance is discussed. High school curriculum choices (College, General, Commercial, Home economics, Industrial arts, Agriculture) of 884 beginning freshmen were related to those aspects of pupils that are routinely and formally available to counselors (Otis quick-scoring mental ability test, Kuder preference record, Bennett and Fry mechanical comprehension test, Minnesota paper form board, age, sex, and family income) Results indicated that the sex variable dominates the first discriminant and clearly differentiates the 2 areas of vocational education for each sex. The second discriminant differentiates the college oriented group from the remainder, but largely in terms of age for grade, family economic circumstance, and orientation to academic areas. The third discriminant differentiates the 2 vocational education areas chosen by young men. Talent figured only lightly in curriculum choise. Results indicated that cultural changes are needed to influence sex roles, and parental orientations to school and learning. Some form of therapy or remediation may be required to change a pupil's image of school and of learning (age at grade) and to gain thoughtful consideration of the concept-application conflict which is the fundamental dichotomy of liberal and vocational education.

Harvard Graduate School of Education, Cambridge, Mass.
"YOU OUGHT TO STUDY....": METHODS AND RESULTS IN RELATION TO THE ELECTION OF A CURRICULUM IN SECONDARY SCHOOL, by Violet Kugris (Educational Research Corp.) and David V. Tiedeman. Rept. no. 11 on Harvard Studies in Career Development; Technical rept. no. 7 on Contract Nonr-1866(31). Aug 59, 46p. 27 refs. AD-226 733.
Order from LC mi$3.30, ph$7.[illegible] PB 148 150

A way to conceptualize people which simultaneously anticipates choice and provides a means of assessing the appropriateness of the choice is sought. An individual's choice of curriculum, college major, or employment is usually considered appropriate when the prediction of success in the chosen endeavor conforms with a level acceptable to some judge. In order to force simultaneous consideration of proportionality, centroid, and dispersion, three judges were given a group of profiles representative of the pool of ability in boys and girls available to a high school in a given year. The judges apportioned the profiles to the curricula of the high school according to the curriculum most appropriate for a particular pattern of ability. The pool of profiles to be sorted provides a means for counselors to resolve differences of opinion. Sorting of a group of profiles of ability indicates how one intends to utilize talents. This method is also applicable to personnel assignments in industry and the Armed Services. If differences of opinion about personnel utilization can be resolved, multivariate distributions appropriate for a choice in a closed system of alternatives could be specified through analysis, and the relative appropriateness of a choice for a person could be reported in terms of the relative frequency with which one's characteristics are found among those for whom each choice is appropriate.

Northwestern U. [Evanston, Ill.]
INTERRELATIONSHIPS AMONG LEADERSHIP CRITERION MEASURES FOR A POPULATION OF AIR FORCE PILOT CADETS, by Donald T. Campbell. Rept. on Contract AF 18(600)170. June 57, 9p. AFPTRC-TN-57-70; AD-131 421.
Order from LC mi$1.80, ph$1.80 PB 148 278

Military Aptitude Ratings (MARs) using a 5-point scale were completed on each cadet by every classmate as well as every military training instructor and every flying training instructor. These three MARs were used to compute the cadet's final military training grade. Other data included grades on non-leadership aspects of training (flying training and academic training); records of demerits at the final training base, and nomination ballots of cadets on classmates who were extremes on leadership. Criterion data were secured on numbers ranging from 239 to 423 men.

Psychology

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
SPECTRAL SENSITIVITY OF THE EYE BASED ON VISUAL ACUITY, by John Lott Brown, Lester Phares, and Dorothy E. Fletcher. Rept. no. 12 on BuMed Task MR 005.13-6002.1. 26 Apr 60, 31p. 11 refs. TED ADC AE-5210; NADC-MA-6006.
Order from LC mi$3.00, ph$6.30 PB 147 785

Threshold relative energy measurements have been made with monochromatic light at 10 millimicron intervals between 400 and 710 millimicrons for threshold criteria which represent a series of visual acuities in addition to light detection. The data can be approximated by summing cone and rod sensitivities derived from earlier independent measurements of light detection by the dark adapted eye in the fovea and the periphery. The relation between the logarithm of threshold energy and visual acuity required by the criterion of threshold has been predicted from monochromatic energy data for several broad spectral distributions of illumination and predictions are compared with empirical data. (Author)

Aviation Psychology Lab., U. of Illinois, Urbana.
MAN-MACHINE TRACKING PERFORMANCE WITH SHORT-PERIOD OSCILLATORY CONTROL SYSTEM TRANSIENTS, by Frederick A. Muckler. Rept. for 1 Nov 54-1 Nov 56 on Human Factors in the Design of Operator Trainers, Contract AF 33(616)2725. Jan 60, 20p. 14 refs. WADD Technical rept. 60-3.
Order from OTS $0.50 PB 161 791

Six skilled subjects performed a single-dimension compensatory tracking task with apparatus incorporating oscillatory transients as control-system dynamics. The period of the transients was varied as the independent variable. System performance, as measured by time-on-target, improved as the transient period was increased from 1.0 to 3.5 seconds. The results are felt to be highly dependent upon specific subject task control techniques. (Author)

California U., Los Angeles.
EFFECTS OF DIFFERENT AMOUNTS OF TRAINING ON ORIGINALITY, by Irving Maltzman, Seymore Simon and others. Technical rept. no. 3 on Contract Nonr-233(50). Aug 59, 8p. 4 refs. AD-225 544.
Order from LC mi$1.80, ph$1.80 PB 148 129

Four groups of subjects received an initial and final free association test scored for originality, followed by the Unusual Uses Test. Group C received a single presentation of the initial list. Groups X_1, X_5, and X_{10}, received one, five, and ten, repetitions of the initial list with instructions to give a different response on each occasion. A fifth group, C_X, received the free association test of originality without the prior training list. The two control groups did not differ significantly on the free association test of originality. Each of the experimental groups was significantly more original than Group C, and Groups X_5 and X_{10} were also reliably more original than Group X_1. The three experimental groups were also significantly more original than Group C on the Unusual Uses Test, but they did not differ significantly from each other. These results were tentatively taken as supporting the hypothesis that originality is a form of learned behavior following the same principles as other forms of operant behavior. (Author)

California U., Los Angeles.
ON THE TRAINING OF ORIGINALITY, by Irving Maltzman. Technical rept. no. 5 on Contract Nonr-233(50). Aug 59, 14p. 31 refs. AD-225 545.
Order from LC mi$2.40, ph$3.30 PB 148 131

The basic problem in the training of originality is to devise a means of increasing the frequency of uncommon behavior. Once it takes place it may receive reinforcement and increase the probability that other original behavior will occur. Earlier attempts to devise training methods for originality were briefly mentioned, as well as related studies of problem solving. A series of experiments by Maltzman and his associates was reviewed and a procedure which consistently facilitated originality was described. This procedure involves the repeated presentation of a list of stimulus words in a modified free association situation accompanied by instructions to give a different response to each stimulus. Under these conditions the responses become more uncommon. When presented with new stimulus materials subjects receiving such training are reliably more original than subjects receiving no training. Tentative suggestions as to the behavioral bases for the training effect were also given. (Author)

California U., Los Angeles.
THE PERSISTENCE OF ORIGINALITY TRAINING EFFECTS, by Irving Maltzman, Seymore Simon and Leonard Licht. Technical rept. no. 4 on Contract Nonr-233(50). Aug 59, 7p. 3 refs. AD-225 741.
Order from LC mi$1.80, ph$1.80 PB 148 130

Two control groups received a single presentation of a free association list followed by free association and Unusual Uses tests of originality after delays of one-hour and two days respectively. Two experimental groups received comparable delays between repeated presentations of the initial list, originality training, and the originality tests. The main effects of training and delay were significant on the free association test of originality, while the main effect of training was significant in terms of unique responses on the Unusual Uses test. These results were interpreted as lending support to the hypothesis that originality is a learned form of behavior which does not differ in principle from other forms of operant behavior. (Author)

Connecticut U. [Storrs].
THE CONDITIONING OF VERBAL ASSOCIATIVE RESPONSES ELICITED BY NON-VERBAL STIMULI, by W. A. Bousfield, P. N. Herman, and G. A. Whitmarsh. Technical rept. no. 33 on Contract Nonr-631(00). Aug 59, 15p. 6 refs. AD-227 915.
Order from LC mi$2.40, ph$3.30 PB 148 147

A study is described which was designed for testing the experimental hypothesis that after a verbal CS and a non-verbal US have been repeatedly presented according to the requirements for classical conditioning, the subsequent presentation of the verbal CS should have the consequence of facilitating the occurrence of the verbal associative responses elicited by the non-verbal US. The method employed a single word as the verbal CS, and a flash of light as the non-verbal US. In the initial training, a memory

drum was used for exposing a list of stimulus words. The verbal CS appeared 14 times with 9 of these appearances reinforced by the flash of light. The remaining words, one of which also appeared 14 times, were not reinforced. Subsequent to this training a forced choice device was used for testing the effects of the initial learning. This involved the use of five tests of the following type for each of four stimulus words including the CS. For each of these words the S was instructed to select from five words the one the stimulus word most made him think of. For each such test one of the five words was a previously determined verbal associate of the non-verbal US. The analyses of the data of two related experiments indicated support for the experimental hypothesis. (Author)

Connecticut U., Storrs.
THE PARASITIC REINFORCEMENT OF VERBAL ASSOCIATIVE RESPONSES, by W. D. Kincaid, Jr., W. A. Bousfield, and G. A. Whitmarsh. Technical rept. no. 32 on Contract Nonr-631(00). Aug 59, 19p. 6 refs. AD-227 916.
Order from LC mi$2.40, ph$3.30 PB 148 146

Two experiments are described which were designed to test the hypothesis that the paired-associate learning of a meaningful response word to a nonsense syllable stimulus should have the consequence of establishing connections between the nonsense syllable and the members of a group of verbal associative responses of the learned response word. Ten nonsense syllable--meaningful word pairs were presented for paired-associate learning to 113 Ss in the first experiment and to 136 Ss in the second. The response words were selected from a set of stimulus words for which free-associated norms had been previously obtained from a population of 150 Ss. A forced-choice test was developed which involved presenting each S with the nonsense syllable stimulus followed by five words one of which was an associate of the learned word. The S was instructed to select the one word which he felt was most related to the nonsense syllable. The selection by the S of the given associate was assumed to demonstrate the prior establishment of a connection between the associate and the nonsense syllable. The results strongly supported the hypothesis. No significant functional relationship was found to exist between the choices of associates in the testing situation and their cultural frequencies of occurrence as responses to the meaningful words. (Author)

Educational Testing Service, Princeton, N. J.
THE INFLUENCE OF INSTRUCTIONS AND OF REPEATED MEASUREMENT ON PERSONALITY-INVENTORY SCORES, by John R. Hills. Rept. on Contract Nonr-2214(00). June 59, 15p. 10 refs. AD-227 346.
Order from LC mi$2.40, ph$3.30 PB 147 453

An experiment was conducted to determine if the measurement properties of an inventory were influenced by whether the examinees were instructed to answer rapidly or to answer deliberately and carefully. Also examined were the speed with which the test was taken and the Total Adjustment scores on the test. It was found that the instructions do change the meaning of the scores. Also, the second form of the test is taken much faster than the first, and the examinees' personalities appear to be more adjusted on the second administration. (Author)

Family Relations Center, San Francisco, Calif.
DISCRIMINANT ANALYSIS OF VARIABLES RELATED TO NONCONFORMITY IN NAVAL RECRUITS, by E. K. Gunderson. Technical rept. no. 11 on Rehabilitation Research, Contract Nonr-1535(00). 20 Aug 59, 14p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 147 688

The present report is concerned, primarily, with an analysis of the relationships among the non-offender control group and the offender sub-groups using Mahalanobis' generalized distance function (D^2) and, secondly, with the application of this analysis to the problem of maximizing separation of offenders and non-offenders.

Harvard Graduate School of Education, Cambridge, Mass.
CAREERS AND FAMILY ATMOSPHERES. AN EMPIRICAL TEST OF ROE'S THEORY, by Douglas Hagen. Rept. no. 10A on Harvard Studies in Career Development, Technical rept. no. 6 on Contract Nonr-1866(31). 22 July 59, 18p. 4 refs. AD-220 413.
Order from LC mi$2.40, ph$3.30 PB 147 701

An attempt was made to test the basic hypothesis of Roe's theory (J. Counseling Psychol. 4:212-217, 1957). The theory deals with the family atmosphere in which the parent and child interact. Roe predicts that (1) a child from a protecting climate will select a service occupation as an adult; (2) a demanding climate disposes a person towards a career in either business contact or general culture; (3) a child from a rejecting climate later chooses a scientific vocation; (4) a neglecting climate orients an individual toward an outdoor occupation; and (5) a person from a casual childhood atmosphere pursues a career in technology as an adult. Data from 245 participants indicated that with one possible exception, Roe's theoretical scheme in its literal translation and specific application has only limited validity. Except in the case of a casual family atmosphere, the posited relationships between specific family climates and a later career choice are not supported by the data.

Harvard Graduate School of Education, Cambridge.
CONCEPTIONS OF SELF AND PERCEPTION OF ROLE IN RELATION TO CONTINUATION IN SCHOOLS OF NURSING, by Anne K. Kibrick (Boston U.) and David V. Tiedeman. Rept. no. 12 on Harvard Studies in Career Development, Technical rept. no. 8 on Contract Nonr-1866(31). Aug 59, 20p. 9 refs. AD-226 734.
Order from LC mi$2.40, ph$3.30 PB 148 149

The perseveration of decisions directing vocational behavior was investigated. It was felt that vocational development is a matter of implementing a self concept and a job concept, and that incompatibilities of either concept give rise to dissatisfaction which in

turn cause one to leave an occupation. Using schools of nursing as a frame of reference, perseveration toward the goal of nursing was studied. All students, having passed aptitude and intelligence tests, were presumed to be capable of completing the course. The experimental postulate was that perseverance in working toward the objective of becoming a nurse is a direct function of the amount of correspondence existing between the images of student and supervisor when the student embarks upon her training. Scores from questionnaires indicated the amount of agreement between an entrant's concept of her task, her role, and herself and the standards of the superiors who would train her. The agreement scores were related to perseveration toward goal in each instance, but the relationship was not very high. Thus, incompatibility at entry with the expectations of those who set the role does not have a marked influence upon staying in a school of nursing for less than six months. However, the prediction of adjustment to a situation requires that the future reality be known at entry as well as possible. (Author)

Human Sciences Research, Inc., Arlington, Va.
A BIBLIOGRAPHY OF SMALL GROUP RESEARCH, by Anita Terauds, Irwin Altman, and Joseph E. McGrath. Rept. on Contract AF 49(638)256. Apr 60, 209p. 2155 refs. HSR-RR-60/2-Gn, supersedes PRA rept. 57-20; AFOSR-TN-60-365.
Order from LC mi$9.30, ph$31.80 PB 147 835

Interaction Lab., Yale U., New Haven, Conn.
GROUP SIZE AND SOCIAL ORGANIZATION, by Morris I. Berkowitz. Technical rept. no. 5 on Problem Solving and Social Interaction, Contract Nonr-609(16). 15 Nov 57, 74p. 143 refs.
Order from LC mi$4.50, ph$12.30 PB 138 123

This study constitutes an attempt to isolate experimentally the effects of group size upon social organization. Forty-two groups, seven each of sizes three, four, six, seven, nine and ten, were selected randomly from the student body of the Basic Submarine School of the United States Naval Submarine Base, New London, Connecticut. These ad hoc groups were trained in the "calculus task" developed by Moore and his colleagues. Following training, each group was placed in a problem-solving situation in which cooperation and agreement were necessary for problem solution. The experimental arrangement was designed in such a way that subjects could communicate only through the medium of a sound-powered phone system; they could not see each other. The data were analyzed through the use of variance techniques. Twenty variables were found to be related significantly to group size.

Louisiana State U., Baton Rouge.
EFFECTS OF MOTIVATION ON CONSISTENCY OF PERFORMANCE IN GROUPS, by Bernard M. Bass. Technical rept. 16 on Behavior in Groups, Contract N7onr-356(09). Feb 58, 8p. 4 refs.
Order from LC mi$1.80, ph$1.80 PB 138 285

A total of 255 ROTC cadets varying in motivation to perform well were given a "teamwork" test in groups of 5. Correlations between their judgements before and after discussions and the changes in these correlations provided measures of the social behavior of the Ss. On 3 of the 4 measures of attempted and successful leadership during a total of 10 trails, corrected split-half reliabilities were highest when motivation was lowest and lowest when motivation was highest. Reliability was never highest for any of the 11 related objective measurements when motivation was highest. It was highest at medium motivation for 5 of the measures and at low motivation for 6 of the measures of leadership, accuracy, stability and agreement with others. The results may be accounted for by the effects of stress on the variability of behavior.

Princeton U., N. J.
A METHOD OF STUDYING INTERACTION UNDER CONDITIONS OF INTERPERSONAL CONFLICT, by W. Peter Janicki and H. M. Schroeder. Technical rept. no. 6 on Contract Nonr-1858(12). Aug 59, 39p. 7 refs. AD-225 784.
Order from LC mi$3.00, ph$6.30 PB 147 694

A technique is described which provides a measure of behavior in interaction situations where an individual's response to an incongruent situation can be studied as a stimulus to another person. Data suggest the following effects: (1) college student dyads are more information oriented (i.e. pair's judgments are more independent of each other) and less normative or source oriented than high school student dyads; (2) for high school dyads friendship enhances an informational orientation, whereas for the college students friendship appears to make little difference in the relative stimulus vs. source weighting; (3) monetary reward for accuracy (information orientation) did not increase the information orientation in reward as opposed to non-reward dyads; and (4) medium IQ dyads are more source oriented, high IQ dyads more information oriented, and low IQ dyads fall in between these two groups.

Research Center for Group Dynamics, U. of Michigan, Ann Arbor.
AN EXPERIMENT ON ACTIVE AND PASSIVE RESISTANCE TO SOCIAL ORDER, Dorwin Cartwright, John R. P. French, Jr. and Edward Sampson. Technical rept. on Contract Nonr-1224(11). 12 Aug 59, 38p. AD-225 836.
Order from LC mi$3.00, ph$6.30 PB 148 148

The concept of resistance, especially as it results in what is called negative conformity, was analyzed by offering a scheme which seeks to elaborate upon the conditions under which such resistance will operate. Three main conditions were examined: (1) a situation of negative identification or negative attraction between the agent (O) and the person (P) in which P actively seeks to be maximally dissimilar from O; (2) a situation in which P perceives O as a false expert; and (3) a situation in which P perceives that O's influence attempt was an unsuccessful attempt to control his behavior and sets up an opposition between conformity and autonomy. From these theoretical concepts a series of hypotheses were derived and tested.

Vanderbilt U., Nashville, Tenn.
STUDIES IN ABSTRACTION LEARNING. I. A COMPARISON OF PERCEPTUAL VERSUS ABSTRACTION LEARNING, by Stanford C. Ericksen. Technical rept. no. 3 on Contract Nonr-2149(01). Aug 59, 19p. 7 refs. AD-220 929.
Order from LC mi$2.40, ph$3.30 PB 147 705

An attempt was made to provide a more explicit integration between thinking (abstraction) and perception as subcategories within the generic area of human learning. Two groups, each of which contained 14 human subjects, were compared in a 3-point, temporal walking maze. One group was blindfolded while the other group had no visual interference. The seeing subjects were labeled perceptual learners since they were free to use all available and relevant maze and room cues in learning to walk the correct temporal pattern via the 3 treadles. The blindfolded subjects were labeled abstraction learners since the external sensory cues were either not available or were irrelevent for controlling the required sequence of movements. The data indicated that seeing and blindfolded subjects can learn a 12-choice temporal walking maze with about equal efficiency. After a shift to a new starting point (rotating the maze) the blindfolded learners showed superior ability in adapting to the new demands of the 3 transfer tasks.

Vanderbilt U., Nashville, Tenn.
STUDIES IN ABSTRACTION LEARNING. II. THE RELATIVE DIFFICULTY OF "PLACE" AND "RESPONSE" LEARNING IN A HUMAN TEMPORAL MAZE, by Stanford C. Ericksen and Charles R. Porter (Master's thesis, Western Reserve U.). Technical rept. no. 4 on Contract Nonr-2149(01). Aug 59, 12p. 2 refs. AD-220 928.
Order from LC mi$2.40, ph$3.30 PB 147 706

A methodological study dominated by operationally defined conditions of perceptual (Place) learning and abstraction (Response) learning is described. The experimental objective was to compare the learning difficulty of a temporal series of Place versus Response decisions. Both tasks involved some degree of abstracting, at least counting, but the Place learners were required to utilize objective, environment cues while the Response learners ignored these external cues and controlled their learning by a self-generated set of directional cues, i. e. to go right or to go left. There were no significant differences in performance scores between the two groups being tested in these walking maze tasks. Within the limits of such a learning situation, it appears that the dependent variable responses that help define abstraction learning are no more difficult to acquire than are those responses, verbal or otherwise, which serve to define perception learning. The larger systematic importance of this series of studies on the abstraction process is believed to rest with the greater specificity given to the mediational processes which are hypothesized to account for the consistency of learning and problem solving in an ever changing environment, i. e. thinking. (Author) (See also PB 147 705)

Vanderbilt U., Nashville, Tenn.
STUDIES IN ABSTRACTION LEARNING. III. THE TRANSFER OF PERCEPTUAL VERSUS ABSTRACTION LEARNING, by Stanford C. Eriksen. Technical rept. no. 5 on Contract Nonr-2149(01). Aug 59, 53p. 9 refs. AD-220 930.
Order from LC mi$3.60, ph$9.30 PB 147 707

A laboratory procedure was developed to observe and measure perception and abstraction learning in a controlled setting. A 3-point walking maze (a 7 ft equilateral triangle) served as the spatial-temporal task in the original learning phase. All subjects learned the same sequence of 12 choices; that is, standing on one treadle, to which of the other two should he walk. Essentially, 2 transfer tasks were used: a 9-in push button finger maze triangle, and rotating the walking maze in the room. The rotation was accomplished by asking the subject to start his trial from a new and different treadle position in the room. The results show no essential difference in efficiency of original learning between the perception learning group (fixed start, normal vision) and the abstraction learners (blindfolded and/or variable start). The transfer testing clearly established the superior transferability and generality of abstraction learning. (See also PB 147 706)

Washington U., Seattle.
DIFFERENTIAL PREDICTION WITH INCOMPLETE CRITERION DATA, by Richard M. Johnson. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). Aug 59, 95p. 14 refs. AD-225 831.
Order from LC mi$5.40, ph$15.30 PB 147 695

The prediction of multiple criteria are considered when there are incomplete criterion data. The appropriate criterion is shown to be the conditional event, success given that individual i participates in criterion activity j. Also shown is that the multiple regression model which yields appropriate predictive information is the method of subgroups, which employs data from only the subgroup of individuals who participate in criterion activity j for the determination of regression weights for the prediction of activity j. Two variants of the method of total groups are discussed. The total group methods employ total group predictor data in the calculation of each vector of regression coefficients, thus removing the necessity of obtaining predictor intercorrelation matrices for all criterion subgroups. While the total group methods involve a substantial saving in computational labor, the extent to which their predictions approach the predictions of the method of subgroups is largely unknown. The method of subgroups and 2 total group methods are compared in a large-scale prediction study. Results show that: (1) the total group methods suffer slight disadvantages over the method of subgroups, which become marked only as the sizes of the subgroups increase; and (2) the total group methods are satisfactory for subgroups of size less than a few hundred. (Author)

Yale U., New Haven, Conn.
A SECOND EXPLORATION OF THE INTERRELATIONS AMONG SOME NON-INTELLECTUAL PREDICTORS OF ACHIEVEMENT IN PROBLEM SOLVING, by Paul C. Berry. Technical rept. no. 5, on Contract Nonr-609(20). May 59, 45p. 18 refs. AD-218 599.
Order from LC mi$3.30, ph$7.80 PB 146 298

The present study is an extension and partial replication of the study described in Technical Report 4 (Berry, 1958). In that earlier study six hypotheses were tested. The results confirmed the first and sixth hypotheses, which involved differences between men and women in achievement in problem solving, but gave only partial confirmation to the second and third, and failed to confirm the fourth and fifth. The present study was undertaken to provide another test of all but the first and sixth hypotheses.

BIOLOGICAL SCIENCES

Army Medical Research Lab., Fort Knox, Ky.
PHAGE-IMPREGNATED PAPER DISCS WITH A METABOLIC INDICATOR FOR THE RAPID TYPING OF RESISTANT STRAINS OF STAPHYLOCOCCUS AUREUS, by Elmo S. Dooley and E. H. Pine. Rept. on Environmental Physiology. 22 Apr 59, 10p. 7 refs. Rept. no. 388; AD-215 750.
Order from LC mi$1.80, ph$1.80 PB 146 267

Bacteriophage-impregnated paper discs containing tetrazolium chloride were used to type 40 strains of coagulase-positive Staphylococci aureus. The results obtained through the use of these phage discs were essentially the same as obtained by the conventional microdrop technique. The phage disc method has advantages over the conventionally used microdrop procedure in that large numbers of standardized discs can be prepared in advance, they may be used from storage as needed, and they reduce the work required to obtain satisfactory results. The use of phage discs places staphylococci typing within the capability of most hospital laboratories and makes the results of typing readily available to the epidemiologist. (Author)

Kansas U., Lawrence.
FLUCTUATIONS AND GENE-ENVIRONMENT INTERACTION OF PUPATION SITE IN DROSOPHILA MELANOGASTER, by Gunther Schlager. Master's thesis. Technical rept. on Gene-Environment Interaction in DDT-Resistance and Related Characters, Contract Nonr-583(08). 31 May 59, 76p. 21 refs; AD-218 329.
Order from LC mi$4.50, ph$12.30 PB 146 297

Fluctuations in the character pupation site of Drosophila melanogastor occur when flies are reared on several batches of corn meal-syrup-molasses-agar medium. A significant added variance component among batches was found under constant external environmental conditions and in the absence of microflora in the vials. These fluctuations are apparently due to the varying chemical changes of two components of the medium: Karo syrup and molasses. When these two components are replaced by pure sugar and salts, the fluctuations are greatly reduced or eliminated. The dry sugar medium was then used in an investigation of the reaction of two selected lines to the same environmental stimulus. These lines responded differently to variations in the amount of water in the medium. This component of the environment is linearly related to the amount of peripherality in both the peripheral line and the unselected parental strain. The central line responded in a manner indicating a resistance to increased peripherality under these conditions. (Author)

Anatomy and Physiology

Air Force Missile Development Center, Holloman AFB, N. Mex.
HISTORY OF RESEARCH IN SPACE BIOLOGY AND BIODYNAMICS AT THE AIR FORCE MISSILE DEVELOPMENT CENTER, HOLLOMAN AIR FORCE BASE, NEW MEXICO, 1946-1958. [1958] 126p. 309 refs.
Order from LC mi$6.30, ph$19.80 PB 148 382

Contents:
The beginnings of research in space biology at the Air Force Missile Development Center, 1946-1952 (issued January 1958)
Major achievements in space biology at the Air Force Missile Development Center, 1953-1957 (issued March 1958)
History of research in subgravity and zero-G at the Air Force Missile Development Center, 1948-1958 (issued May 1958)
Major achievements in biodynamics: escape physiology at the Air Force Missile Development Center. 1953-1958 (issued June 1958)
Research accomplishments in biodynamics: deceleration and impact at the Air Force Missile Development Center, 1955-1958 (issued October 1958)
Administrative history of the Aeromedical Field Laboratory at the Air Force Missile Development Center, 1951-1958 (issued July 1958)

Army Medical Research Lab., Fort Knox, Ky.
SEASONAL ACCLIMATIZATION TO COLD IN MAN, by Thomas R. A. Davis, D. R. Johnston, and F. C. Bell. Rept. on Environmental Physiology. 25 May 59, 9p. 7 refs. Rept. no. 386; AD-216 006.
Order from LC mi$1.80, ph$1.80 PB 146 268

The decrease in shivering and heat production effected in man by seasonal change indicates that physiological acclimatization to climate takes place in man. Since similar physiological changes in animals are associated with an increase in resistance to cold, it is possible that man's resistance to cold can also be increased in like manner. Moreover the acclimatized man operates in the cold with greater economy as compared to the unacclimatized individual. It is proposed that this economy is achieved in large measure by a decrease in heat loss via the respiratory system. The seasonally acclimatized man shows evidence of the presence of non-shivering thermogenesis. The failure of heat acclimatization to change the criteria of cold acclimatization indicates that the two mecnanisms are not mutually exclusive and de-acclimatization is due not to the presence of the other but to the absence of the adequate acclimatizing stimulus. (Author)

Army Medical Research Lab., Fort Knox, Ky.
SOME CHARACTERISTICS OF SHIVERING IN MAN, by T. R. A. Davis, D. R. Johnston, and F. C. Bell. Rept. on Environmental Physiology. 21 May 59, 17p. 13 refs. Rept. no. 383; AD-216 005.
Order from LC mi$2.40, ph$3.30 PB 146 269

The variability of the onset of shivering between individuals cannot be correlated with surface area, race of surface or core cooling, occupation, age, or latitude of origin. After its onset shivering is maintained in a cyclic manner which appears to bear no relationship to changes in skin temperature. The mean rise in shivering activity significantly correlates with the falling skin temperature and not at all with changes in rectal temperature. Short duration inhibition of shivering is readily obtained by physical and psychical means. (Author)

Army Ordnance Human Engineering Labs., Aberdeen Proving Ground, Md.
THE EFFECTS OF FOUR HOURS CONFINEMENT IN MOBILE ARMORED PERSONNEL CARRIERS ON SELECTED COMBAT RELEVANT SKILLS: A PILOT STUDY, by Samuel A. Hicks and Raymond M. Eckstrom. [1960] 38p. 7 refs. Technical memo. 3-60.
Order from LC mi$3.00, ph$6.30 PB 147 162

This study was undertaken to determine changes in general combat relevant performance as a result of four hours confinement in a maneuvering Armored Personnel Carrier (APC). Fifty enlisted men were tested both before and after confinement on tests designed to measure stamina, response time, gross motor coordination, arm steadiness, equilibrium and eye-arm coordination. The four-hour confinement period resulted in losses in all areas. The losses were statistically significant in three areas. Recommendations are included for future research. (Author)

Duke U. Medical Center, Durham, N. C.
RESPIRATORY AND CIRCULATORY RESPONSES OF THE HYPOTHERMIC ANIMAL TO CARBON DIOXIDE STRESS, by F. G. Hall and John Salzano. Rept. on Physiology of Flight, Contract AF 33(616)3821. Mar 60, 16p. 10 refs. WADD Technical rept. 60-82.
Order from OTS $0.50 PB 161 798

Some respiratory and circulatory responses to carbon dioxide stress during ice-water immersion hypothermia were studied in 13 dogs. Stresses were imposed by increasing the carbon dioxide tension of the inspired gas in 8 animals and by intravenous infusion of gaseous carbon dioxide in 5 other animals. It was found that, when compensation is made for the depressed ventilation exhibited at low body temperature, animals responded to the carbon dioxide stresses in essentially the same manner in the hypothermic as in the normothermic state. However, the responses are of a lower order of magnitude. (Author)

Karolinska Institutet, Stockholm (Sweden).
STUDIES OF THE PHYSIOLOGY OF DISTURBANCES OF MOTOR CONTROL, by Ottavio Pompeiano. Technical (Final) rept. on Contract AF 61(052)115. 30 Sep 59, 9p. 3 refs. AFOSR-TR-59-161; AD-232 389.
Order from LC mi$1.80, ph$1.80 PB 146 097

The first group of researches concerns the problem of the fast control of mammaliam muscle spindles. An early discharge was also elicitable from muscle spindle afferents when stimulating muscle nerve or ventral root. This early discharges was found to consist of two components, one appearing in advance of visible contraction. The other, at the foot of the contraction. The last research concerns the study of a types of 'release' in tension-extension diagrams from cat's forelimb extensor muscle (tricips).

Naval Research Lab., Washington, D. C.
ANALYSIS OF VISUAL SENSITIVITY TO DIFFERENCES IN VELOCITY, by R. H. Brown. Interim rept. 6 May 60, 18p. 51 refs. NRL rept. 5478.
Order from LC mi$2.40, ph$3.30 PB 145 720

This report analyzes the data of an extensive experimental literature. Visual sensitivity to differences in velocity has been commonly measured by presenting two objects which move at slightly different but constant speeds. The least detectable difference in speed is the differential threshold for the magnitude of velocity. The threshold $\Delta\omega$ varies in direct proportion to the speed ω over a range from 0.1 to 20 degrees of visual angle per second for nonsuperimposed objects. When the objects are presented so that they are viewed separately, $\Delta\omega/\omega$ is the constant 0.0768. When a single moving object instantaneously changed speed, $\Delta\omega/\omega$ is the constant 0.138. Special considerations are involved in the extremely low ratio found when one moving object is seen in front of another. The report concludes with an application of the constancy in velocity discrimination to tracking and other predictive behavior. (Author)

Naval School of Aviation Medicine, Pensacola, Fla.
IDIOPATHIC ORTHOSTATIC HYPOTENSION AND ITS RELATIONSHIP TO POSITIVE G TOLERANCE, by J. J. Zarriello. 21 May 59, 12p. 12 refs. Proj. NM 11 01 11 Subtask 1, Rept. no. 13.
Order from LC mi$2.40, ph$3.30 PB 147 635

This report concerns the problem of orthostatic hypotension occurring in supposedly normal, young males not having the classical, clinical symptoms of orthostatic hypotension, but having demonstrated a fall in blood pressure both systolic and diastolic on assuming the upright position. Two case histories are presented in which the individuals had no past history of dizziness or syncope on assuming the upright position but were rendered unconscious while performing aerobatic maneuvers that usually produce no untoward physiological symptoms in the normal pilot. These individuals demonstrated markedly reduced greyout, blackout, and unconscious tolerance to positive G when subjected to human centrifugation as compared to 115 normals. (Author)

Tulane U. School of Medicine, New Orleans, La.
STUDIES OF RESPIRATORY FUNCTION FOLLOWING THORACIC AND THORACO-ABDOMINAL INJURIES. I. PULMONARY COMPLIANCE, by Morton M. Ziskind, R. P. Cameron, and Oscar Creech, Jr. Rept. on Contract DA 49-007-MD-796. July 57, 9p. 10 refs. AD-212 764.
Order from LC mi$1.80, ph$1.80 PB 146 121

The pulmonary compliance of human subjects studied in the supine position was obtained from simultaneous intra-thoracic (intra-esophageal) and tidal volume changes. Strain gauge transducers were activated by these changes to produce loops upon a cathode ray oscilloscope screen. The loops were easily reproducible for a given subject and were permanently recorded on 35 mm. photographic film. Preliminary observations were made on normals, patients with diffuse pulmonary disease and patients before and after thoracotomy. The compliance values obtained were in agreement with those of other workers. Diffuse interstitial infiltrative disease decreased compliance but rarely affected the general contour of the loop. Pain and voluntary changes of respiration produced gross distortion of the loops. The compliance slope was reduced in the presence of intra-thoracic masses and chest wall incisions. The reduction of compliance following thoracotomy was usually reversed in one week. Initial studies of subjects with hemopneumothorax following stab wounds showed that the compliance was initially reduced but was almost invariably restored to the normal range following the aspiration of air and blood. (Author)

Biochemistry

Army Chemical Warfare Labs., Army Chemical Center, Md.
OBSERVATIONS ON SERUM AND GONAD CHOLESTEROL IN PIGEONS, by Roger A. Hoffman. Mar 60, 15p. 21 refs. CWLR 2374; AD-234 997.
Order from LC mi$2.40, ph$3.30 PB 147 628

Serum cholesterol of pigeons undergoes a seasonal cycle in concentration with maximal values present in April and minimal values in August. No sex differences were apparent and both sexes exhibited this yearly fluctuation in cholesterol concentration regardless of the state of activity of the reproductive organs. Consequently, a regulation of serum cholesterol by the gonads appears improbable. Cholesterol concentration is high in the small, undeveloped testis and declines rapidly when gonad development tarts. This concentration is inversely proportional to the logarithm of relative testis weight. The logarithm of cholesterol content of the testis is directly related to the logarithm of testis weight. The data suggest that testicular cholesterol is involved in gonad growth and increased mass rather than in spermatogenesis or hormone production. (Author)

Mississippi U. Medical Center, Jackson.
THE EVALUATION OF METABOLIC AND TOXIC EFFECTS OF INTRAVENOUS FAT EMULSION IN PATIENTS, by Curtis P. Artz. Rept. for 1 May 58-31 Jan 59 on Contract DA 49-007-MD-930. Feb 59, 5p. 2 refs. AD-212 288.
Order from LC mi$1.80, ph$1.80 PB 146 122

Efforts have been directed toward three phases of investigation: (a) The effect of long-term administration of fat emulsion on liver function and the coagulation mechanism, (b) the use of intravenous fat emulsion as supplemental nutrition, (c) the effect of intravenous fat emulsion on survival of the red blood cell. From the various studies carried out in all three phases it appears that 10-14 units of intravenous fat emulsion are safe and effective. Should an increased amount be necessary for appropriate therapy, liver function tests and coagulograms should be done at regular intervals. Any deviation from normal values should warn of impending danger and therapy should be discontinued. When values return to normal, therapy might be reinstituted. Intravenous fat has proved very beneficial as a supplement to an inadequate oral intake.

Oak Ridge National Lab., Tenn.
STUDIES ON THE MOUSE HEMOGLOBIN LOCUS: IDENTIFICATION OF HEMOGLOBIN TYPES AND LINKAGE OF HEMOGLOBIN WITH ALBINISM, by Raymond A. Popp and W. St. Amand. Apr 60, 5p. 13 refs. AFSAM rept. 60-52.
Order from LC mi$1.80, ph$1.80 PB 147 779

The mouse hemoglobin locus is closely linked to albinism and on the opposite side of it from pink-eye. In mice heterozygous for different hemoglobin types, each hemoglobin type is present autonomously. This indicates that the inheritance of hemoglobin traits in mice may be similar to that in man. Differences among single-type hemoglobins have been reported, but whether these variations are controlled by different hemoglobin alleles or are caused by interactions of the hemoglobin locus with other loci remains to be established. The occurrence of different hemoglobin types in a small sample from a population of wild mice was also noted. (Author)

Oklahoma State U. Research Foundation, Stillwater.
ISOLATION OF CRYSTALLINE UREASE, by George Gorin, L. G. Butler and others. Technical note no. 5 on Studies on Urease, Contract AF 18(603)135. Feb 60, 19p. 17 refs. AFOSR-TN-60-238.
Order from LC mi$2.40, ph$3.30 PB 147 631

An account is presented of some experiences encountered in the course of preparing the crystalline urease. After many unsuccessful and partially successful attempts, several preparations of high activity (89-106 S.U./mg.) were obtained, and it is believed that a detailed description of the successful procedure, and a briefer discussion of related matters, should prove of value to other investigators interested in the preparation of the crystalline enzyme.

Botany

Marine Lab., U. of Miami [Coral Gables, Fla.]
SALT WATER FUNGI, by Ernest S. Reynolds and Samuel P. Meyers. Interim rept. on Contract Nonr-1811(00). 1 Aug 59, 23p. ML 59184; AD-225 175.
Order from LC mi$2.70, ph$4.80 PB 147 718

Uni-clonal cultures of selected marine Ascomycetes and Deuteromycetes on Manila cordage in 0.1% yeast extract sea water broth demonstrated extensive development of cellulolytic activity together with significant tensile strength reduction. The reduction of

tensile strength of the cordage varied considerably between species, from 74 to 183 lbs. at the breaking point, compared to the average breaking point of the uninoculated control material of 260 lbs. The notable loss of strength by cordage when used as a growth substrate for the various lignicolous salt water fungi, demonstrates in positive fashion the destructive action of these fungi on wood fibers. The close similarity of cordage and wood in proximate analysis, except for the lower lignin content of the cordage, provides an especially favorable opportunity for strength test studies in relation to pertinent physiological and morphological characteristics of the various fungi. (Author)

School of Aviation Medicine, Brooks AFB, Tex.
BOTANIC ASPECTS OF POLLINOSIS IN THE AREA OF SAN ANTONIO, TEXAS, by Robert A. Davidson. Jan 60, 60p. 56 refs. Rept. 60-20.
Order from LC mi$3.60, ph$9.30 PB 147 777

The contents of this paper are divided into three interrelated parts: Part I takes up some of the features of pollen idiotoxic specificity and attempts to rationalize these in the light of certain fundamentals of plant evolution. The importance of the relationship between pollen allergy and botany is stressed. Part II is an accounting of what may be termed the "hay fever flora" of the San Antonio, Tex., area. Part III presents the data of an air-borne pollen survey which was conducted at Randolph Air Force Base. (Author)

Pathology

Chicago U., Ill.
EXPERIMENTAL OBSERVATIONS ON POSTURAL NYSTAGMUS: LESIONS OF THE NODULUS, by Cesar Fernández, René Alzate, and John R. Lindsay. Jan 60, 18p. 22 refs. AFSAM rept. 60-23.
Order from LC mi$2.40, ph$3.30 PB 147 459

This investigation supports the idea that the nodulus acts as an inhibitor of the vestibular centers. Disequilibrium and postural nystagmus in the vertical plane characterize the deficit following ablation of the nodulus. Unlike animals with lesions in the corpus cerebelli, these experimental animals exhibit no abnormalities in posture and no cerebellar ataxia. The occurrence of postural nystagmus requires the presence of signals from vestibular receptors indicating positional changes of the head, but disturbances of equilibrium do not. This indicates a dual function of the nodulus: inhibition of the vestibular centers and, in conjunction with other systems, maintenance of equilibrium.

University Coll., Dublin (Eire).
STABILITY OF ERYTHROCYTES IN ANAEMIA (SIC). Final Technical rept. no. 4 for 28 Jan 59-28 Feb 60 on Contract DA 91-591-EUC-1070. 4 May 60, 5p.
Order from LC mi$1.80, ph$1.80 PB 147 657

It has been possible to analyze the distribution and activity of several enzymes localized in the erthrocyte, which either hydrolyze or phosphorylize adenosine nucleotides. Distribution of the enzyme depends considerably on the method of preparing the haemolysis and particulate suspension from laked cells. Pursuit of the storage lesion indicated a necessary study of ATPase activity. This enzyme is magnesium activated and has special activator requirements. Closer study revealed the presence in the stroma of a very active adenylic acid kines which effects the conversion of two molecules of ADP into one of AMP and one of ATP. After a preliminary examination of the general properties of this enzyme, a more exact investigation has been concluded. In this series of investigations it has been possible to examine the series of degradations of enzyme induced type which can dismember components of the nucleotide pool.

Pharmacology and Toxicology

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE EFFECTS OF CONTINUOUS EXPOSURE OF ANIMALS TO ETHANOLAMINE VAPOR, by Maurice H. Weeks, Nelson P. Musselman and others. Technical rept. for Mar-Dec 57 on Health Hazards of Military Chemicals. Mar 60, 22p. 23 refs. CWLR 2366. AD-234 688.
Order from LC mi$2.70, ph$4.80 PB 147 549

Investigations were carried out to evaluate the toxicity of monoethanolamine (MEA) when inhaled continuously for long periods. Continuous exposure of dogs, rats, and guinea pigs to 12 ppm (or higher) MEA caused behavioral effects and skin irritation. Exposure to very high concentrations (66 ppm to 102 ppm MEA) caused death and produced lung inflammation and liver and kidney damage in dogs, rats, and guinea pigs. Exposure of animals to 5 ppm produced minimal toxic effects. (Author)

Army Chemical Warfare Lab., Army Chemical Center, Md.
TOXICITY AND PERSONAL DECONTAMINATION OF BORON HYDRIDE PROPELLANT FUELS, by Sidney Rothberg, Joseph L. Colbourn, and Robert Salvatore. Feb 60, 15p. 13 refs. CWLR-2355; AD-233 964.
Order from OTS $0.50 PB 161 772

A study was made of the toxicity of certain liquid boron hydride fuels (BHF) of the HEF-3 and HiCal class. The fuels were administered to rats, guinea pigs, rabbits, and cats by the intravenous, intraperitoneal, oral ocular, and skin routes. Materials were tested to find an effective skin decontaminant. Surgical glove material and several silicone-based ointments were tested for their ability to protect against skin penetration; neither gave adequate protection. An aqueous ammonia solution was found to be useful in reducing the toxicity of BHF, but its function appears to be that of solubilizing the fuel for easy removal rather than destruction of the toxic moiety. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE TOXICITY OF BORON OXIDE, by James L. Wilding, W. J. Smith, II, and others. Jan 60, 18p. 15 refs. CWLR-2334; AD-233 768.
Order from OTS $0.50 PB 161 771

A study has been made to determine the toxicity of aerosols of fine particles of boron oxide, chiefly by observations on rats and dogs that had inhaled the aerosol for periods up to 24 weeks. Even in very high concentrations, 470 mg/cu m, rats that were exposed showed no signs of poisoning or any pneumoconiosis. There were some significant changes in the urinary content and pH of the exposed rats. All groups of rats exposed to concentrations of 77 and 470 mg/cu m gained weight at about the same rate as their controls. No changes or toxic signs were noted in the mature female dogs exposed for 23 weeks to a concentration of 57 mg/cu m. Histological observations of rat tissues, and blood analyses of both rats and dogs, were similar to the controls throughout the test period. Topical application produced a transitory erythema on the wetted backs of rabbits, and conjunctivitis when applied to the eyes. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
TOXICOLOGY OF MONO- AND DI-ISOPROPENYLACETYLENE, by Leo Feinsilver, Sidney Rothberg and others. Feb 60, 18p. 3 refs. CWLR-2341.
Order from LC mi$2.40, ph$3.30 PB 147 683

Toxicity tests of two liquids, mono- and di-isopropenylacetylene (IPA and DIPA), were carried out on laboratory animals. Selected pharmacological studies with DIPA were also made. IPA and DIPA were more toxic by intravenous than by intraperitoneal administration. IPA was more toxic than DIPA by intravenous administration and about equally toxic by intraperitoneal administration. The vapor of DIPA was more toxic than IPA vapor. The cutaneous toxicity of both compounds was low and similar, as was their ocular toxicity. When administered by intravenous and intraperitoneal injection and by vapor inhalation, IPA and DIPA affected the central nervous system and caused pathologic changes in the respiratory tract. Intravenous administration of IPA and DIPA caused congestion or hemorrhage of several other internal organs. Repeated intraperitoneal injection and acute vapor inhalation of DIPA caused necrosis of the tubules of the kidney cortex of the mouse. Repeated application of IPA and DIPA to the skin of the rabbit caused necrosis of the epidermis. Application of IPA and DIPA to the eye of the rabbit caused marked damage but no corneal opacity. Intravenous injection of DIPA produced cardiac slowing, hypotension, reduction of the heart-contractile force, reduction in voltage of the encephalogram, and effects upon gut activity. (Author)

School of Aviation Medicine, Brooks, AFB, Tex.
EFFECTS OF SOMATOTROPIN ON METABOLIC RESPONSES TO COLD, HEAT, AND ALTITUDE, by Henry B. Hale and Roy B. Mefferd (Baylor U. Coll. of Medicine). Jan 60, 22p. 10 refs. Rept. 60-34.
Order from LC mi$2.70, ph$4.80 PB 147 458

The administered STH had, in many respects, corrective effects or augmented (reinforced) adaptive changes during chronic exposure or during the initial phase of recovery from chronic exposure. Sensitivity to the injected STH varied with environments, with the length of time in an environment, and with the metabolic functions themselves.

Radiobiology

Tulane U., New Orleans, La.
INVESTIGATIONS OF THE BIOLOGICAL EFFECTS OF MICROWAVE RADIATION, by Robert T. Nieset, Rene Baus, Jr. and others. Annual progress rept. for 1958 on Contract Nonr-475(03). [1959] 61p. 11 refs. AD-225 409 and 225 837.
Order from LC mi$3.90, ph$10.80 PB 147 69?

Investigations are reported of biological effects of microwaves other than those resulting from any major increase in overall body temperature. Studies of the effects of low intensity pulsed 10 cm radiation on the growth rate of mice provided negative results. Cold blooded animals were exposed to 45 mw/sq cm in a refrigerated environment to eliminate or reduce possible effects from previous gross overall heating. Under these conditions lizards survived 2 hr or more of exposure (such exposure would normally cause mice to die of hyperpyrexia in less than 10 min). Exposure with concurrent refrigeration to moderate levels or radiation appeared to provide localized heating effects. The reflection coefficient and the depth of penetration were calculated for various tissue combinations for 1, 3, and 10 cm radiation to further characterize thermal relationships coincident with the absorption of microwaves. The results of preliminary studies of dielectric saturation were negative. (See also PB 137 143)

Uppsala U. (Sweden)
RESEARCH ON "LOCALIZED RADIO-LESIONS". PART III. BLOOD VESSEL CHANGES FOLLOWING LOCAL IRRADIATION OF THE BRAIN WITH HIGH ENERGY PROTONS, by Börje Larsson. Technical rept. no. 1, Appendix 5, on Contract AF 61(514)1247. 1 Dec 59, 18p. 14 refs. AFOSR-TN-60-252; AD-233 375.
Order from LC mi$2.40, ph$3.30 PB 146 305

The cerebral cortex and thalamus in the brain of the rat were locally irradiated with a narrow beam of high-energy protons. The developing radiolesion was studied, with attention given to changes in capillary function. Three types of changes were graded: impairment of capillary circulation, increase of permeability of trypan blue through the blood-brain barrier system, and necrosis. Circulatory disturbances seem to precede the blue-staining of irradiated brain tissue. The mechanisms involved in the rapid development of lesions described here might be different from those involved in the production of late delayed radionecrosis. The results show that the detection of changes in the blood-brain barrier system with suitable dyes or radioactive compounds may be applied as a means of early diagnosis of the radiolesion. (Author)

Analytical Chemistry

Industrial Lab., Mare Island Naval Shipyard, Vallejo, Calif.
ESTIMATION OF CHLORIDE CONCENTRATION IN HIGH PURITY WATER BY ION EXCHANGE, by W. C. Neuenschwander. 14 Aug 58, 16p. Research and Development rept. no. 3954-58.
Order from LC mi$2.40, ph$3.30 PB 146 036

A method for determining chloride concentrations in water by ion exchange techniques has been developed. The method utilizes a mixed bed ion exchange resin for collecting chloride ions from a large volume of sample. Subsequent elution with nitric acid and turbidimetric evaluation in a small volume completes the procedure. Chloride ion in water can be estimated to a value as low as 0.01 ppm in a one liter sample, or 0.003 ppm in four liters. A sample apparatus for performing the test has been developed. (Author)

Naval Ordnance Test Station, China Lake, Calif.
COOPERATIVE TEST PROJECTS OF THE JOINT ARMY-NAVY-AIR FORCE PANEL ON ANALYTICAL CHEMISTRY OF SOLID PROPELLANTS. PART I. INTRODUCTION TO THE FIRST TWELVE ROUND ROBINS AND ROUND ROBIN 1, by R. H. Pierson. 12 Feb 58, 60p. 9 refs. NOTS-1937, Part 1; AD-163 047.
Order from LC mi$3.60, ph$9.30 PB 148 055

Contents:
Instructions for JANAF-PACSP Round Robins
Round Robin 1, nitroglycerin in JPN and H9 propellants

Naval Research Lab., Washington, D. C.
MODIFICATIONS IN THE NRL COLORIMETRIC METHOD FOR THE DETERMINATION OF BIS(2-CHLOROETHYL)SULFIDE WITH DB-3, by A. Stamulis. Interim rept. 16 May 60, 13p. 6 refs. NRL rept. 5426.
Order from OTS $0.50 PB 161 066

A program was undertaken to study and improve the present NRL colorimetric method for the determination of bis(2-chloroethyl)sulfide, commonly known as mustard gas. That part of this program which has been directed toward improving sensitivity and color stability has established the fact that hexylene glycol and Methyl Cellosolve are more effective solvents than diethyl phthalate, especially when determining residual quantities of mustard in paint films. Inorganic alkalies such as aqueous solutions of sodium carbonate, potassium carbonate, and sodium hydroxide were found to be more stable than cyclohexylamine as developing agents. The effects of pH, age, water content, and heating time on the DB-3 solutions were determined and it was found that the only modification which improved the sensitivity was in the heating period of the mustard-containing DB-3 solution, and accordingly the heating period was changed from 5 to 4 minutes. (Author)

Rock Island Arsenal Lab., Ill.
RADIO-CHROMATOGRAPHIC DETERMINATION OF 12-HYDROXYSTEARIC ACID IN FATTY ACID MIXTURES, by Max T. Fisher and W. Dennis McHenry. 28 Apr 60, 45p. 9 refs. Rept. no. 60-911.
Order from LC mi$3.30, ph$7.80 PB 147 430

Vital to the worked and water stability properties of MIL-G-10924A type greases is their 12-hydroxystearic acid content. A chromatographic method was developed which separates 12-hydroxystearic acid from other fatty acids used in grease formulations. Fatty acid samples of known composition (50% 12-hydroxystearic acid) were eluted with n-hexane-chloroform and benzene-ethanol systems through two grades of silica gel. The separation efficiencies were obtained by melting point determinations and by the use of radioactive tracers. Radiometric determinations of doubly tagged samples (12-hydroxystearic acid-H^3 and stearic acid-C^{14}) were made by gas flow techniques using an appropriate absorber and a control sample. Complete separation of radioactively tagged materials was obtained by using a relatively nonporous, large surface area, partially deactivated silica gel (15% water) and eluting with benzene followed by benzene-ethanol (97:3). Apparent, but unsubstantiated, separation of 12-hydroxystearic acid from unsubstituted saturated monocarboxylic fatty acids containing 14 to 22 carbon atoms was also obtained. (Author)

Rutgers [State U.] New Brunswick.
THE CHANGES WITH TIME OF THE CHROMIUM IONS, ZINC IONS, AND PHOSPHORIC ACID IN THE WP-1 COMPOSITION, by E. R. Allen, Leo Ojakaar, and others. Final technical rept. for year ending 30 Nov 56 on Contract Nonr-404(07). 5 Dec 56, 147p 27 refs.
Order from LC mi$7.20, ph$22.80 PB 147 465

An insoluble chromium-phosphorus-resin complex (or mixture), gray green in color and insoluble in alcohol, distinctly different from the familiar bright-green chromium-phosphorus-resin complex, has been isolated. The fate of chromium in the WP-1 mix is viewed as follows: in the fresh, i. e., 1 hour, charge some chromium^{+6} has been reduced and most of the chromium^{+3} so produced enters into organic combination. The amount of chromium^{+6} reduced increases with time and the amounts of both types of complexes likewise increase, while the amount of chromium^{+3} remains small and approximately constant. An appreciable amount of phosphorus is present in the recovered pigmentary residues, presumably as phosphates of zinc and this increases slightly with time. Appreciable amounts of zinc occur in the aqueous extracts. The evidence from pH values of aqueous extracts raises doubts as to whether free phosphoric acid exists at the 1 hour stage. Zinc, chromium, and phosphorus unite with the resin in WP-1 mixtures. Changes in PVBA with time, including the resulting production of degredation products, are now viewed as of probable importance in the WP-1 deterioration. Phosphoric acid effects a change in the PVBA during film formation.

Inorganic Chemistry

College of the Holy Cross, Worcester, Mass.
STUDY OF A SERIES OF RELATED LIGANDS WITH SPECIFIC METALS AT CONSTANT IONIC STRENGTH AND AT THREE DIFFERENT TEMPERATURES, by Joseph A. Martus, Richard J. Hovey and others. Final rept. for 15 May 52-15 June 55 on Contract DA 19-020-ORD-1614. [1955] 17p. OOR rept. no. 347.6; AD-73 476.
Order from LC mi$2.40, ph$3.30 PB 147 854

The chelate stability constants are tabulated for α-mercaptobutyric acid and Cu, Ni, and Mn at 0°, 30°, and 60°C. No significant results were obtained with 2-hydroxybutyric acid and Cu, Mi, Mn, and Mg at 0° and 60°C. The results obtained with α-hydroxybutyric acid at 30°C are presented. Stability constants obtained for alanine and Cu, Ni, Zn, and Cd at 0° and 60°C are given.

Pennsalt Chemicals Corp., Wyndmoor, Pa.
THE THERMAL STABILITY OF METAL AMMINES. I. PENTAMMINECHLOROCHROMIUM(III) CHLORIDE, by Norman D. Peschko and B. P. Block. Technical rept. no. 3 on Contract Nonr-2687(00). 1 Aug 59, 13p. 5 refs. AD-225 087.
Order from LC mi$2.40, ph$3.30 PB 148 133

Thermogravimetric analysis indicates the loss of two moles of NH_3 from $[Cr(NH_3)_5Cl]Cl_2$ at about 250° C. in air followed by a complete loss of NH_3 as the temperature is raised. At constant temperatures of 150, 200 and 300°C. in air, however, decomposition is essentially smooth with no arrests indicated for intermediate ammines. Nevertheless it is possible to isolate a homogeneous material with empirical composition $Cr(NH_3)_3Cl_3$ by careful thermal treatment of $[Cr(NH_3)_5Cl]Cl_2$ in air. This product differs from that formed by thermal treatment of $[Cr(NH_{3.5}Cl]Cl_2$ in anhydrous HCl. The latter is not a monomeric isomer of $Cr(NH_3)_3Cl_3$ as previously suggested. Decomposition temperatures obtained by thermogravimetric analysis should be interpreted with care because of the relatively rapid heating rates customarily employed. (Author)

Organic Chemistry

Florida U. Engineering and Industrial Experiment Station, Gainesville, Fla.
THE PREPARATION OF FLUORINE-CONTAINING COMPOUNDS, by R. D. Dresdner, J. A. Wethington and J. A. Young. Final rept. on Contract Nonr-580 (03). 31 Aug 59, 22p. AD-227 841.
Order from LC mi$2.70, ph$4.80 PB 148 172

Oxygen compounds: The electrofluorination of $O(CH_2CH_2COCl)_2$ was attempted as a first step in the synthesis of perfluorodivinyl ether, $(CF_2=CF)_2O$. Perfluoro ethyl ether was pyrolyzed at temperatures up to 800°C; the major products were COF_2 and C_2F_6. Nitrogen compounds: When $CF_3CF=CF_2$ was reacted in a flow system with NF_3 in about equimolar quantities over NaF, the main course of the reaction(s) suggested no catalytic activity but rather the fluorination of C_3F_6. Phosphonitrilic fluorides: $(PNF_2)_3$ and $(PNF_2)_4$ were prepared by passing either CF_3SF_5 or NF_3 over P_3N_5 heated to 700°C. Bis(trifluoromethyl) carbamyl fluoride, $(CF_3)_2$ NCOF, was prepared by an electrochemical process, and $(CF_3)_2$ NCF_2COOH was prepared by a cell process. Sulfur compounds: During the pyrolysis of cyclic perfluorothioxane tetrafluoride, SF_4 was produced and the residual free radical underwent ring closure so that perfluoro tetramethylene oxide was formed almost exclusively. The synthesis of SF_5CF_2COF was undertaken by electrochemical treatment of CH_3SCH_2COCl; however, the desired cleavage did not occur. Catalysts for fluorocarbon studies: Successful isotope exchanges were conducted with alkali fluorides containing F^{18} and $CF_3CF=CF_2$, C_4F_{10}, $(C_2H_5)_2O$, and CF_4.

Harvard U., Cambridge, Mass.
ANALYSIS OF THE RESULTS OF PREVIOUS NMR STUDIES ON SOME ORGANIC DERIVATIVES OF SILICON, GERMANIUM, AND TIN, THE SANDWICH COMPOUNDS, AND RELATED MOLECULES (I). IMPROVEMENTS OF THE NMR SPECTROMETER AND VARIABLE TEMPERATURE CRYOSTAT (II), by Nathan Ockman. Technical rept. on Contract Nonr-1866(13). Aug 59, 59p. 42 refs. AD-229 397.
Order from LC mi$3.60, ph$9.30 PB 147 703

Part I: A discussion is presented of the characterization of the molecular motions in solids by nuclear magnetic resonance (NMR), including the analysis of line shape and spin lattice relaxation time and the determination of barrier heights. The data obtained from the NMR studies of 48 compounds are reviewed. Part II: The RF oscillator in the NMR spectrometer was replaced by the latest modification of the Pound-Watkins oscillator. A 60-cycle rejection filter was inserted between the output of the oscillator and the input to the lock-in amplifier (LIA). Mulay's LIA was replaced by a modified Watkins LIA in which a twin-T filter with a narrower band width had been substituted. With this apparatus, proton resonance signals with signal to noise ratios of 50 or more were obtained in ferrocene at room temperature. A cryostat, based on a design by Mulay (AD-135 507), was built. A cylindrical glass tube was substituted for the liquid-He Dewar and a thin Cu tube, on which the heater was wound, was inserted about the RF coil tube and grounded to the RF ground of the oscillator. Using this apparatus, 20 watts of heater power raised the temperature of an H_2O sample from -165° to 50°C, with a thermal gradient at -50°C of 8°C/inch. A steady state condition at any temperature in this range was reached in about 15 min.

Johns Hopkins U., Baltimore, Md.
IODINE NUCLEAR QUADRUPOLE RESONANCE SPECTRA OF SOME BORON-IODINE COMPOUNDS, by William G. Laurita and Walter S. Koski. Technical note no. 13 on Boron Hydride Chemistry, Contract AF 18(600)1526. [1960] 14p. 9 refs. AFOSR-TN-60-471.
Order from LC mi$2.40, ph$3.30 PB 147 763

The 1/2→3/2 iodine nuclear quadrupole transitions in iododecaborane (4) and iodopentaborane (1) have been observed at 190.8 and 196.2 Mc./sec., respectively. The splittings of the iodine resonances in BI_3 were measured for the 1/2→3/2 and 3/2→5/2 transitions. These splittings were 24 ± 2 and 43 ± 3 Mc./sec., respectively. The corresponding splittings in the iodoboranes are believed to be smaller than the resolution of the equipment and consequently have not been detected. The quadrupole coupling constants are interpreted in terms of the electronic structure of the boron-iodine bonds. The splittings of the resonances in BI_3 were found to be in reasonable agreement with theoretical expectations. (Author)

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
SOME STUDIES ON CERTAIN METHYL DERIVATIVES OF SILICON, GERMANIUM AND TIN, by Michael P. Brown. Technical rept. on Contract Nonr-1866(13). Aug 59, 31p. 33 refs.
Order from LC mi$3.00, ph$6.30 PB 147 716

Contents:
Dimethylgermanium oxide and dimethylgermanium sulfide, by M. P. Brow and E. G. Rochow
The infrared spectra of some methyl derivatives of germanium and tin, by M. P. Brown, R. Okawara and E. G. Rochow
Nuclear magnetic resonance studies of some methyl derivatives of the Group IVB elements, by M. P. Brown and D. E. Webster

Massachusetts Inst. of Tech., Cambridge.
STUDIES IN ORGANOMETALLIC CHEMISTRY, by D. Seyferth, N. Kahlen and M. A. Weiner. Technical rept. no. 2 on Contract Nonr-1841(43). 5 Aug 59, 41p. 10 refs. AD-225 334.
Order from LC mi$3.30, ph$7.80 PB 147 691

The preparation and some reactions of vinyllithium (Pub. in Chemistry and Industry, 402, 1959). The oxymercuration of trimethylvinylsilane (Pub. in Zeitschrift für Naturforschung 14b:137, 1959). Group IV (Iso) cyanides I. Trimethyl (iso) cyanogermane and trimethyltin (iso) cyanide (Submitted for pub. in the Journal of the American Chemical Society). Trimethyl (iso)cyanogermane was prepared by the reaction of isopropyl germanium iodide with AgCN in the presence of C_6H_6. Trimethyltin (iso)cyanide was prepared by the reaction of AgCN with trimethyltin bromide in the presence of C_6H_6, in 62% yield, and by the reaction of aqueous KCN with trimethyltin iodide in ether, in 20% yield. Group IV (Iso)cyanides II. (Iso)cyanides of silicon, germanium and tin as ligands in iron carbonyls (Submitted for publication in the Journal of The American Chemical Society). Trimethyl(iso)cyanisolane and trimethyl(iso)cyanogermane reacted with iron pentacarbonyl to form yellow, crystalline, sublimable and extremely air-sensitive $(CH_3)_3SiN{=}C\text{-}Fe(CO)_4$ and $(CH_3)_3GeN{=}C\text{-}Fe(CO)_4$ in good yield. Trimethyltin (iso)cyanide reacted with iron pentacarbonyl, but the analogous $(CH_3)_3SnN{=}C\text{-}Fe(CO)_4$ was formed only in very low yield, while anionic iron carbonyl species were formed in a side reaction.

Mellon Inst., Pittsburgh, Pa.
STEREOREGULARITY IN THE FREE RADICAL POLYMERIZATION OF VINYL ACETATE (PART I). MODELS OF STEREOREGULAR POLYMERS (PART II). THERMALLY STABLE POLYMERS CONTAINING THE TRIAZINE RING (PART III). ON THE ANOINIC POLYMERIZATION OF STYRENE BIPHENYL-SODIUM, A NEW INITIATOR (PART IV). ANIONIC POLYMERIZATION (PART V), by T. G. Fox, R. Donald Spencer and others. Technical rept. no. 2, 28 Feb-31 Aug 59, on Contract Nonr-2693(00). [1959] 73p. 34 refs. AD-230 119.
Order from LC mi$4.50, ph$12.30 PB 147 725

Part I: Preliminary evidence indicated that the observed differences in IR absorption and/or in solubility of polyvinyl acetate prepared under different conditions may be due to differences between various samples in OH content or in the concentration of impurities. Part II: Vinyl acetate was polymerized in the presence of chain transfer agents: trimethyl orthoformate (I), $CHCl_3$, and AcH. A chain transfer constant of 0.00076 was obtained for I and an approximate value of 0.01 for $CHCl_3$. Part III: A 50% yield of triphenyl triazine was obtained by the pyrolysis benzamidine. The bracketing of the reaction conditions favoring triazine ring-closure was somewhat successful. Conditions which favor the formation of benzonitrile and NH_3 were also learned. Part IV: A one-stage low-temperature polymerization of styrene with Na-naphthalene did not lead to an extremely sharp molecular weight distribution. Part V: Two-stage polymerization of styrene in tetrohydrofuran with Na-naphthalene, the polymerization of styrene with butyllithium, and alkali metal-initiation polymerization of α-methylstyrene are discussed. (See also PB 144 900)

Naval Ordnance Test Station, China Lake, Calif.
MICRO DETERMINATION OF NITROGEN IN ORGANIC COMPOUNDS, by E. M. Bens. 29 Apr 58, 30p. 41 refs. NOTS-1988; NAVORD rept. 5865; AD-162 637.
Order from LC mi$2.70, ph$4.80 PB 148 030

A micro method, which is of particular interest to propellant chemists, has been developed for the determination of nitrogen in organic compounds. The method is a modification of the Dumas method that utilizes a nickel oxide-nickle combustion tube filling heated to 1000°C, a supply of pure oxygen for the combustion of difficult samples, hopcalite for the oxidation of carbon monoxide, and a weight nitrometer. The oxygen supply, the combustion tube filling, and means for the removal of excess oxgyen have been changed from previous methods. (Author)

Naval Ordnance Test Station, China Lake, Calif.
SYNTHESIS AND REDUCTION OF METHYL-VINYLNITROSAMINE AND RELATED COMPOUNDS, by N. Neil Ogimachi and Howard W. Kruse. 1 Sep 59, 20p. 7 refs. NOTS TP-2303; NAVORD rept. 6578; AD-225 489.
Order from LC mi$2.40, ph$3.30 PB 148 031

The synthesis and reduction of methylvinylnitrosamine are described. Starting with β-methylaminoethanol, it was possible to prepare methylvinylnitrosamine through a sequence of reactions involving nitrosation, chlorination, and dehydrohalogenation. The reduction of methyl-1-vinylhydrazine. Depending upon the reducing agent, the reduced products obtained were methylethylnitrosamine, methylamine, methylhydrazine, and 1-methyl-1-ethylhydrazine. Attempts to prepare 1-methyl-1-vinylhydrazine from β-methylaminoethanol through alternative routes are also described. (Author)

Naval Research Lab., Washington, D. C.
WETTING PROPERTIES OF TETRAFLUOROETHYLENE AND HEXAFLUOROPROPYLENE COPOLYMERS, by Marianne K. Bernett and W. A. Zisman. Interim rept. 24 May 60, 7p. 13 refs.
NRL rept. 5471.
Order from LC mi$1.80, ph$1.80 PB 145 397

It has been shown that the determining factors in the wetting of low-energy solid surfaces are the nature of the atoms in the surface and their physical packing. Of all solid organic polymers polytetrafluoroethylene is known to have the lowest surface energy and thus the lowest critical surface tension of wetting (γ_c). In this study the wettability of a series of copolymers of tetrafluoroethylene with hexafluoropropylene by a variety of organic and inorganic liquids was examined. The results show that these solid plastics have critical surface tensions which are even lower than that of solid polytetrafluoroethylene. As anticipated, the progressive increase in the proportion of perfluoromethyl side chains in the polymer introduces a higher concentration of exposed $-CF_3$ groups in the surface, which in turn progressively reduces γ_c. By extrapolation γ_c of a polyhexafluoropropylene has been calculated to give the value 15 dynes/cm. (Author)

North Dakota U., Grand Forks.
ORGANOMETALLIC CHEMISTRY OF TRANSITION METALS, by Lawrence Summers and Shan-Pu Tsai. Interim technical rept. no. 5, 1 June 56-31 May 57, on Contract Nonr-582(00). 27 Dec 57, 17p.
Order from LC mi$2.40, ph$3.30 PB 138 076

Investigations on bis-(cyclopentadienyl) compounds of zirconium and chromium, and the reaction of diphenyl bis-(cyclopentadienyl)-titanium with excess phenyllithium.

Richmond Research Lab., Stauffer Chemical Co., Calif.
INORGANIC POLYMERS PROGRAM, by A. J. Laffler, E. G. Teach and others. Semi-annual technical rept. for 1 July 57-1 Jan 58 on Contract Nonr-2259(00). [1958] 18p. 17 refs.
Order from LC mi$2.40, ph$3.30 PB 138 264

Work is continuing on the efficient preparation of fluorocarbon diiodides and dinitriles for monomers. No satisfactory dehydration of perfluoroglutaramide to the nitrile has been found but work is continuing on this and also on the preparation perfluoroadiponitrile. The new compound tris(trimethylsilyl) phosphine has been prepared and its reaction with diborane has been studied. (See also PB 135 554)

Yale U., New Haven, Conn.
SYNTHESIS AND STUDY OF NON-BENZENOID AROMATIC HYDROCARBONS, by William von Eggers Doering. Final narrative summary rept. for 10 May 52-30 Apr 58 on Contract DA 19-059-ORD-1562. [1958] 8p. OOR rept. no. 542.3C; AD-137 086,
Order from LC mi$1.80, ph$1.80 PB 147 858

The synthesis of other members of the non-benzenoid aromatic hydrocarbons besides fulvene and azulene was attempted. A successful synthesis of fulvalene involved a reaction of sodium cyclopentadienide with iodine at low temperatures to give an unstable dihydrofulvalene (I). Compound I was converted to the dilithium salt. Pentance solutions of pure fulvalene were obtained by passing O into a suspension of the dianion. Heptafulvalene was synthesized by a simple sequence of reactions starting with tropylium bromide. Heptafulvene was prepared by a long tedious route involving a final Hofmann elimination. Neither sesquifulvalene nor heptalene could be prepared.

Physical Chemistry

Battelle Memorial Inst., Columbus, Ohio.
A METHOD FOR MEASUREMENT OF THE HEAT OF FORMATION OF SILICON CARBIDE, by J. W. Droege and J. F. Foster. Final rept. for 15 May 59-30 Apr 60 on Contract AF 19(604)5720. 30 Apr 60, 21p. AFCRC-TR-60-139.
Order from LC mi$2.70, ph$4.80 PB 148 094

Sodium peroxide calorimetry has been investigated as a method for the determination of the heat of formation of SiC. Zirconium was found to be a suitable container material; corrosion losses amounted to no more than a few milligrams in each experiment. Reaction with the fuels SiC, Si, and C was not complete, but the reaction product could be analyzed for unreacted sample. Benzoic acid was used as a combustion aid and oxygen at 5 atm as an oxidation promotor. The method seems well suited to the SiC determination. (Author)

California U., Berkeley.
THE PHOTOLYSIS OF CARBON DIOXIDE, by Bruce H. Mahan. Rept. on Contract AF 49(638)01. 9 May 60, 23p. 8 refs. AFOSR-TN-60-472.
Order from LC mi$2.70, ph$4.80 PB 147 837

The vacuum ultraviolet photolysis of carbon dioxide has been investigated. Kinetic data and quantum yield measurements indicate that electronically excited (^1D) oxygen atoms are produced in the primary process at 1470 A and 1236 A. Such a primary process is consistent with the tentative spectral assignments which have been made for carbon dioxide. (Author)

Catalysis Research Lab., Alfred U., N. Y.
A STUDY OF THE CORRELATION BETWEEN THE DEFECT SOLID STATE AND CATALYSIS, by Thomas J. Gray. Annual summary rept. for Feb 59-Feb 60 on Contract AF 49(638)288. [1960] 16p. 12refs AFOSR-TN-60-410.
Order from LC mi$2.40, ph$3.30 PB 147 496

The effects of radiation from a carbon arc lamp on the adsorption of oxygen on zinc oxide and zinc sulfide (in both pure and copper-activated forms) were studied. It was shown that oxygen was chemisorbed on all of the samples examined. Pure and copper-activated zinc oxide exhibited reversible photodesorption, preceded in the latter case by an initial photoadsorption. Pure zinc sulfide exhibited irreversible photoadsorption but the copper-activated sulfide was qualitatively analogous to the activated oxide. Preliminary experiments indicate that ethylene may be polymerized over irradiated zinc oxide and apparatus has been constructed to extend these observations and to examine the oxidation and hydrogenation of organic materials in the vapor phase over irradiated zinc oxide. (Author)

Colorado U., Boulder.
THEORY OF MICROWAVE ABSORPTION BY COMPRESSED OXYGEN GAS, by Masataka Mizushima. Rept. on Contract Nonr-1147(05). [1959] 19p. 11 refs. AD-219 927.
Order from LC mi$2.40, ph$3.30 PB 148 144

A theoretical explanation of the deviation between observed microwave absorption by high pressure oxygen gas and the prediction by the simple Van Vleck Weisskopf theory is attempted. Non spherical part of the intermolecular force is considered and distortion of energy levels and wave functions is calculated. It is found that the non-resonant absorption vanishes and a low frequency ($\sim$ 10 kMc) resonance appears at high pressure, while the 60 kMc resonance does not change much. This theory can explain the observed data. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
ELECTRODE KINETICS OF OXIDATION-REDUCTION COUPLES, by A. P. Bond and D. Singman. 15 Apr 60, 32p. 13 refs. TR-835.
Order from LC mi$3.00, ph$6.30 PB 146 398

Electrode kinetics of several oxidation-reduction couples were investigated by means of polarization measurements at platinum, carbon, titanium, and tantalum electrodes. The Ti^{+++}-TiO^{++} and Br_2 -Br^- couples were found suitable for use at the anode and cathode, respectively, of a redox fuel cell using carbon electrodes. The use of these couples with porous carbon electrodes, through which the active solutions were circulated, led to a voltage drop, caused by electrode polarization, of 0.18 v at the anode and 0.09 v at the cathode at a current density of 200 ma/cm^2. (Author)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
A STUDY OF THE ALTERATION OF WATER DROPLET SUPERCOOLING BY FOREIGN VAPORS, by Joseph C. Mullins, Warren P. Hendrix and others. Scientific rept. no. 1 on Contract AF 19(604)4970. 29 Feb 60, 38p. 9 refs. AFCRC-TN-60-505.
Order from LC mi$3.00, ph$6.30 PB 147 488

An investigation was made of the freezing temperature of small water droplets in the presence of nitrogen, air, methane, argon and a mixture of nitrogen and argon. An expansion chamber was employed, and droplet temperatures at the moment of freezing were calculated being careful to correct for the latent heat of condensation. Freezing temperatures were found to vary slightly depending on the ambient gas. With nitrogen the freezing temperature was -45.5°C; methane, -44.6°C; air, -42.9°C; and an approximately equal mole per cent mixture of nitrogen and argon, -43.0°C. Argon did not give consistent results; freezing temperatures with it varied from -41.0 to -51.0°C. (Author)

Indiana U., Bloomington.
CHEMICAL REACTIONS OF IONIC BEAMS, by Walter J. Moore. Final rept. on Contract DA 33-008-ORD-891. Nov 57, 3p. 6 refs. AD-155 402; OOR rept. no. 1010.3; AD-155 402.
Order from LC mi$1.80, ph$1.80 PB 147 865

Research was undertaken to develop techniques and methods for studying the reactions of gaseous ions in the form of monoenergetic ion beams. Emphasis was placed on studying the sputtering phenomena.

Institute of Mathematical Sciences, New York U., N. Y.
THREE-BODY RECOMBINATION OF OXYGEN ATOMS, by Ernest Bauer and Morris Salkoff. Rept. on Contract AF 19(604)4555. Apr 60, 34p. 74 refs. Research rept. no. CX-47; AFCRC-TN-60-404.
Order from LC mi$3.00, ph$6.30 PB 147 292

A quantum mechanical perturbed stationary state calculation has been made of the rate of recombination of oxygen atoms in the presence of an oxygen molecule as third body. The recombination is considered to take place into highly excited vibrational levels ($v = 9, 10$) of the $A^3\Sigma^+$ state of O_2. There are no adjustable parameters in the calculation: for the interaction potential the results (for O_2 $X^3\Sigma^-_g$) obtained in a previous calculation have been used; these results were obtained by comparison with experimental measurements of vibrational relaxation times in oxygen. At temperatures of the order 300 - 3000°K, the calculated recombination coefficient into these two vibrational levels is of the order $2 - 10 \times 10^{-33}$ cm^6/sec, which agrees to within better than a factor of 3 with recent experimental measurements.

Johns Hopkins U., Baltimore, Md.
KINETICS OF THE DEUTERIUM EXCHANGE BETWEEN DIBORANE AND DIMETHYLAMINODIBORANE, by J. S. Rigden and W. S. Koski. Technical note no. 14 on Boron Hydride Chemistry, Contract AF 18(600)1526. [1960] 26p. 10 refs. AFOSR-TN-60-470.
Order from LC mi$2.70, ph$4.80 PB 147 764

The kinetics of the deuterium exchange between diborane and dimethylaminodiborane have been studied. The course of the reaction was followed by means of gas density measurements. The concentrations of both reactants were varied over a 20-fold range in order to establish the orders of the reaction. The reaction was found to be first order with respect to dimethylaminodiborane and half-order with respect to diborane. The activation energy was found to be 27.8 ± 3 kcal. By variation of the surface-to-volume ratio it was determined that, to within experimental error, the reaction is homogeneous. A mechanism has been proposed in which the rate-determining step is the reaction between the intermediate BH_3 and dimethylaminodiborane. The rather high activation energy is consistent with a postulated symmetrical intermediate in the rate-determining step. (Author)

Kansas U., Lawrence.
RESEARCH AND DEVELOPMENT ON THE EQUILIBRIUM CONSTANTS AND ACTIVITY COEFFICIENTS OF ION EXCHANGE RESINS, by William J. Argersinger, Jr. Final rept. for 1 Sep 51-1 Sep 54 on Contract DA 23-072-ORD-222. 30 Sep 54, 126p. 10 refs. OOR rept. no. 84.3; AD-42 310.
Order from LC mi$6.30, ph$19.80 PB 147 853

The Ag-Na, Zn-H, and Ag-H exchanges on Dowex at 25°C were extensively investigated. A theoretical treatment of the solvent H_2O activity in exchange equilibrium is presented and applied to the Na-H exchange system. The basic principles of a method of determining solution activity coefficients from cation exchange data are discussed, and an approximate treatment was used to determine activity coefficients of $AgNO_3$ and $NaNO_3$ in their mixed solutions from the ion exchange measurements. The determination of individual mean activity coefficients, and their appropriate rations, from electromotive force measurements on suitable galvanic cells containing mixed electrolyte solutions is discussed. The method was applied to the study of $ZnCl_2$-$CdCl_2$ and $ZnCl_2$-HCl mixed aqueous solutions.

Laboratori di Elettrochimica, Chimica Fisica e Metallurgia del Politecnico di Milano (Italy).
RESEARCHES ON HYDROGEN OVERVOLTAGE ON METALLIC SINGLE CRYSTALS: SILVER AND LEAD, by L. Peraldo Bicelli and B. Rivolta. Rept. on The Structure and Properties of Interfaces, Contract AF 61(052)144. Apr 60, 27p. 23 refs. WADC Technical note 59-393.
Order from OTS $0.75 PB 161 801

Hydrogen overvoltage on silver and lead single crystal cathodes oriented following the (100), (110) and (111) planes has been measured, in sulfuric acid solutions for silver, and perchloric acid and sulfamic acid for lead. Tafel law holds true, the parameters are coincident for all of the silver electrodes, while they are different for the different lead electrodes. (Author)

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
AN APPLICATION OF ABSOLUTE RATE THEORY TO DIFFUSION IN THE SOLID STATE, by R. W. Armstrong, J. P. Hirth, and G. M. Pound. Rept. on Contract Nonr-760(08). [1959] 9p. 9 refs. AD-220 511.
Order from LC mi$1.80, ph$1.80 PB 147 709

Fick's first law is derived from absolute rate theory for diffusion of a component in solid solution in order to determine the correct thermodynamic factor in the equation for intrinsic diffusivity. This factor is found to be $\gamma_i[1 + (d \ln \gamma_i / d \ln c_i)]$, and it is concluded that the mobility must be proportional to activity coefficient γ_i. The resulting expression for the self-diffusion coefficient D_i^R of a component in a homogeneous alloy is used to evaluate coefficients γ_i of the activated species from observed values of D_i^R and γ_i in the system Ni-Ag (Author)

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
EFFECT OF ELASTIC STRAIN ON THE ELECTRODE POTENTIAL OF METALS, by Ling Yang, G. T. Horne, and G. M. Pound. Technical rept. on Contract Nonr-760(08). [1959] 18p. 13 refs. AD-225 050.
Order from LC mi$2.40, ph$3.30 PB 148 141

The relationship is reviewed between stress and chemical potential to see how the unexpectedly large potential shifts and their change in sign between tension and compression may be explained in terms of thermodynamics. Only accretion constraints are applicable for reversible transport of substance to an elastically stressed pure solid, or for reversible transport of a substitutional solute to an elastically stressed solid solution. These constraints lead to an equation for increase in chemical potential at an X surface of a pure solid upon isothermal application of stress in the Y and/or Z directions and to an equation for the reversible electrode potential shift at that surface. An equation is formulated which expresses the increase in chemical potential of a substitutional solute upon isothermal application of non-hydrostatic elastic stress to a solid solution. Only absorption constraints are applicable for reversible transport of interstitial solute to an elastically stressed solid solution. The chemical potential of an interstitial solute is independent of direction of the solid surface and increases on compression but decreases on tension. Conclusion is reached that the only possible thermodynamic explanation is that the observations relate to transport of interstitial impurities between metal electrode and electrolytic solution. Hydrogen ion is suggested as a likely impurity. Only extremely high stresses, such as those which occur about line imperfections, would contribute appreciable to the corrosion rate of metals or alloys.

Naval Radiological Defense Lab., San Francisco, Calif.
STABILITY OF RADICALS PRODUCED BY IRRADIATION, by T. H. Anderson and R. S. Alger. 6 July 59, 13p. 3 refs. Research and Development Technical rept. USNRDL-TR-342; AD-220 313.
Order from LC mi$2.40, ph$3.30 PB 148 057

The concentration of free radicals in methanol at -196°C produced by electron bombardment cannot go above 1/2 M percent because the back reaction speeds up and the species crowd close enough to react with each other. These cage effects show up as the temperature goes up or down. (Author)

Oxford U. (Gt. Brit.)
RECOMBINATION OF ATOMS AT SURFACES. PART 7. HYDROGEN ATOMS AT SILICA AND OTHER SIMILAR SURFACES, by M. Green, K. R. Jennings and others. Rept. on Contract AF 61(514)1117. Feb 60, 28p. 22 refs. AFOSR-TN-59-869.
Order from LC mi$2.70, ph$4.80 PB 147 499

The recombination coefficients for hydrogen at a silica surface and a number of others such as boric oxide have been determined at temperatures between 20° and 600°C. The effect of washing and treating the silica surface in different ways has also been examined. It is possible to account for the results that have been obtained by reasonable assumptions regarding the mechanism of the recombination process, the nature of the silica surface and the changes that occur in it as a result of various treatments. (Author)

Pennsylvania State U., University Park.
THE EFFECTS OF m- AND p-SUBSTITUENTS ON THE POLAROGRAPHIC OXIDATION OF ANILINE. EVIDENCE FOR THE SUBSTITUTED BENZENE RADICAL-ION INTERMEDIATE, by Irwin Fox, Robert W. Taft, Jr. and J. M. Schempf. Technical rept. no. 22 on Contract Nonr-656(05). June 59, 38p. 53 refs. AD-218 587
Order from LC mi$3.00, ph$6.30 PB 146 280

Attempts were made to establish whether or not the trends noted in a plot of $\Delta E1/2(E1/2$ meta or para substituted aniline $-E1/2$ unsubstituted aniline) vs Hammett σ values for one line defined by the points for m-CH_3, m-Cl, m-NO_2, and H, and a second line, approximately parallel to the first but displaced downward, defined by the points for the p-OCH_3, p-Cl, and p-NO_2 substituents could be placed on a quantitative basis. Efforts were also made to determine unambiguous substituent effects on the polarographic oxidation of aniline and several N, N-dimethylaniline derivatives.

Pennsylvania U., Philadelphia.
IONS IN LIQUID HELIUM, by K. R. Atkins. Technical rept. no. 3 on Contract Nonr-551(28) [1959] 34p. 20 refs. AD-220 497.
Order from LC mi$3.00, ph$6.30 PB 147 721

The mobility of an ion in liquid He^4 is known to be appreciably less than the mobility of a He^3 atom. This is explained by the suggestion that electrostriction effects increase the liquid density in the immediate vicinity of the ion so that the ion drags around with it about 50 He^4 atoms. If an almost free electron can exist in the liquid there may be an additional effect which results in a still greater effective mass. The way in which these concepts might be used to calculate the mobilities is briefly discussed. Various experimental consequences of this picture of an ion are suggested. (Author)

Princeton U., N. J.
SURFACE DIFFUSION AND RECOMBINATION HYDROGEN ATOMS ON GLASS, by Kin Tsu (Doctoral thesis) and Michel Boudart. Rept. on Contract AF 49(638)32. [1959] 37p. 26 refs. AFOSR-TN-60-195.
Order from LC mi$3.00, ph$6.30 PB 147 660

A kinetic study of the recombination of hydrogen atoms on glass has been carried out. At low temperatures, the catalytic rate appears to be limited by the adsorption process on the entire surface. At higher temperatures, it becomes controlled by the surface diffusion of adsorbed atoms to uniformly distributed active sites. At still higher temperature, reaction takes place directly and exclusively on the active sites. A theory is presented that describes the transition between the kinetic regimes and the regime of surface diffusion. The experimental data, characterized by a complicated Arrhenius behavior, are explained by this heretofore unexplored mechanism of heterogeneous catalysis. (Author)

Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
IONIZATION IN ROCKET FLAMES, by J. Nichol, V. Siminski and H. G. Wolfhard. Rept. on Contract AF 49(638)305. [1960] 17p. 12 refs. AFOSR-TN-60-285.
Order from LC mi$2.40, ph$3.30 PB 147 545

The temperature in the combustion chamber of a rocket motor can be sufficiently high to maintain a relatively large degree of thermal ionization when small quantities of an alkali metal are added to the flame gases. This paper describes a series of measurements of ion concentrations obtained under various conditions in a rocket motor combustion chamber.

Rensselaer Polytechnic Inst., Troy, N. Y.
PRECISE MEASUREMENT OF DENSITY AND SURFACE TENSION AT TEMPERATURES UP TO 1000°C IN ONE APPARATUS, by Max R. Lorenz and George J. Janz. Technical rept. no. 3 on Contract Nonr-591(10). Aug 59, 20p. 9 refs. AD-226 420.
Order from LC mi$2.40, ph$3.30 PB 147 712

A method for the precise measurement of surface tension and density of molten salts in one apparatus at temperatures up to 1000°C is reported. The essential features of the apparatus are a density bob of special design to enable surface tension data to be gained simultaneously, and a continuously variable height crucible arrangement for the liquid sample. A description of the apparatus and the calibration procedures are given in detail. The results for molten potassium nitrate up to 470°C are reported to illustrate the method. (Author)

Stanford Research Inst., Menlo Park, Calif.
PHOTOCHEMISTRY IN THE SOLAR FURNACE, by Rudolph J. Marcus and Henry C. Wohlers. Final rept. on Contract AF 19(604)3477. 28 Dec 59, 57p. 16 refs. SRI Proj. SU-2508; AFCRC-TR-60-223.
Order from LC mi$3.60, ph$9.30 PB 147 489

The solar furnace can be used as a cool, intense light source. Equipment has been designed for use of this light source for photochemical reactions in the liquid phase. Evidence is presented on the stoichiometry and mechanism of the photoreduction of ceric perchlorate as it proceeds in the solar furnace. Light from the focal spot of the furnace also has been obtained as parallel light in order to make spectral

and energy measurements. The use of a furnace with front-silvered optics is described. Two energy storing reactions have been studied with this light source. Of these, the cerous-ceric reaction does not produce measurable quantities of hydrogen, and the photolysis of nitrosyl chloride will require a flow system in order to avoid back reactions. It is obvious that other and better energy-storing reactions need to be investigated, using this novel light source. (Author)

Technical U., Vienna (Austria)
THE ADSORPTION OF TOBACCO SMOKE: HOW FAR IS A CIGARETTE ITS OWN FILTER? by Alfred Dobrowsky. [Final rept. pt. H, 1 Dec 58-30 Sep 59, on Behavior of a Streaming Aerosol and its Interaction with Solid Obstacles] Contract DA 91-591-EUC-1011. [16 Nov 59] 7p. 2 refs. AD-230 180.
Order from LC mi$1.80, ph$1.80 PB 148 312

An experimental program was conducted to determine the ability of tobacco for absorbing tobacco smoke aerosol. A 100-g, 68-mm cigarette was smoked by forcing 40 cc of air through it in 2 sec; the process was repeated 2 times per minute. This smoke was passed through a second cigarette of identical size and finally into wadding traps. The tobacco aerosol was elutriated from the tobacco of the second cigarette and from the wadding with di-n-octyl phthalate. Repeated experiments established that an average of 61.4% of the aerosol was trapped by the tobacco in the second cigarette and 38.6% by the wadding. It was estimated that a 15 mm cellulose acetate filter adsorbs the same amount of tobacco aerosol as 17 mm of tobacco.

Technical U., Vienna (Austria)
AEROSOLS OF HCL-H_2O AND SO_3-H_2O. PART I. ISOTHERMIC PROCESS, by Alfred Dobrowsky. [Final rept. pt. B, 1 Dec 58-30 Sep 59, on Behavior of a Streaming Aerosol and its Interaction with Solid Obstacles] Contract DA 91-591-EUC-1011. [16 Nov 59] 13p. 6 refs. AD-230 178.
Order from LC mi$2.40, ph$3.30 PB 148 310

Assuming that the stability of an aerosol is given by the equality of the components partial pressures above the liquid aerosol and in the gasroom the systems H_2O and SO_3-H_2O are considered. In the HCL-H_2O system we have two partial vapor pressures. HCL and H_2O. In the SO_3-H_2O system part of the water vapor is consumed in transforming SO_3 into H_2SO_4. A further part of water vapor is consumed in diluting the said H_2SO_4 until the water partial pressure of the H_2SO_4-H_2O aerosol is equal to the partial pressure of the remaining gaseous water vapor. Formulas are given for the aerosol masses as a function of the HCL or SO_3 mass and temperature and relative humidity in an isothermic process. The aerosol masses are tabulated for 9 meteorological conditions, i.e., for 0°, 15°, 30°, each at 70, 85, 100% relative humidity and each for 6 different masses of HCL or SO_3. (Author)

Technical U., Vienna (Austria)
AEROSOLS OF HCl-H_2O. PART II. ADIABATIC PROCESS, by Alfred Dobrowsky. [Final rept. pt. C, 1 Dec 58-30 Sep 59, on Behavior of a Streaming Aerosol and its Interaction with Solid Obstacles, Contract DA 91-591-EUC-1011]. [16 Nov 59] 11p. 5 refs. AD-230 174.
Order from LC mi$2.40, ph$3.30 PB 148 311

Into an air volume of 22400cm^3 at 0°, 15° and 30° and a relative humidity of r=70% and 100% a mass of 18, 72 and 288mg HCl gas is introduced, i.e., 1/2, 2 and 8 millimol. In every case the aerosol mass generated by an isothermic process is bigger than by an adiabatic process. The aerosol mass generated by small amounts of HCl surpasses the HCl mass many times (e.g. 18mg HCl, 0°, r=100%: isothermic 68mg fog, adiabatic 49mg). In the contrary a big amount of HCl gives a relatively small amount of fog (e.g. 288mg HCl, 0°, r=100%: isothermic 126mg fog, adiabatic 54mg). Aerosol's HCl concentration is high at low temperatures (e.g. 18mg HCl, r=100%, adiabatic: 0°, 22, 7% HCl; 30° 16, 5%) and dry air (e.g. 18mg HCl, r=70%, 0°, adiabatic: 24, 5%HCl). Rise of temperature by adiabatic process is greatest with warm and damp air (e.g. 18mg HCl, r=100%: 0° Δt=3, 8°; 30° Δt=5, 5°) and high HCl masses (e.g. 288mg HCl, r=100%, 30°: Δt=11°). When r=70% becomes Δt only circa the half of the said values. The proportion between isothermic and adiabatic fog masses is at 0° circa 1, 4: 1, at 30° circa 3:1 and heat generated by the said processes is nearly in the same proportion. Regularly the HCl concentration is bigger in an isothermic generated fog than in an adiabatic one. Only small amounts of HCl give the contrary effect. (Author) (See also PB 148 310)

Technical U., Vienna (Austria)
AEROSOLS OF SO_3+H_2O. PART III. by Alfred Dobrowsky. [Final rept. pt. D, 1 Dec 58-30 Sep 59, on Behavior of a Steaming Aerosol and its Interaction with Solid Obstacles] Contract DA 91-591-EUC-1011. [16 Nov 59] 11p. 3 refs. AD-230 179.
Order from LC mi$2.40, ph$3.30 PB 148 309

Aerosols generated by different amounts of sulfur trioxide gas and air of different temperatures and humidities are considered. The aerosol mass, acid concentration, specific density and normality are calculated. The rising of temperature by adiabatic process is computed, as heat is produced by condensation of SO_3 and H_2O gas, compounding H_2SO_4 and dissolving it with further water approaching from gaseous status. (Author) (See also PB 148 310, PB 148 311)

Technical U., Vienna (Austria).
THE DISTRIBUTION OF PARTICLE SIZES IN AEROSOLS, by Alfred Dobrowsky. [Final rept. pt. A, 1 Dec 58-30 Sep 59, on Behavior of a Streaming Aerosol and its Interaction with Solid Obsticles] Contract DA 91-591-EUC-1011. [16 Nov 59] 20p. AD-230 176.
Order from LC mi$2.40, ph$3.30 PB 146 055

Boltzmann's equation gives the energy distribution among a multitude of particles, and the expression

$W(\varepsilon) = B.\varepsilon^{-h.A(\varepsilon)} . d\varepsilon$ gives the probability $W(\varepsilon)$ of finding a particle at an energy level $A(\varepsilon)$. Upon dispersal of a mass the surface area will increase. To increase the surface, energy has to be extended

against the surface tension. Therefore a mass divided into very small particles will assume a higher energy level. By taking for a certain particle size a certain energy level we are able to find the size distribution law of an aerosol. The time of fall depends upon particle size according to Stokes' law. So for a certain size distribution we can compute the sedimentation rate, and vice versa, we also can prove the theory's results by experimental means. (Author)

Technical U., Vienna (Austria)
EFFICIENCY OF SOME MATERIALS FOR AEROSOL FILTERING, by Alfred Dobrowsky. [Final rept. pt. G, 1 Dec 58-30 Sep 59, on Behavior of a Streaming Aerosol and its Interaction with Solid Obstacles] Contract DA 91-591-EUC-1011. [16 Nov 59] 6p. 2 refs. AD-230 203.
Order from LC mi$1.80, ph$1.80 PB 148 306

Experiments were made with tobacco smoke to determine the aerosol-filtering efficiencies of various materials as compared to cellulose acetate filters. Pressure drop, streaming velocity, and filter space were kept constant. Wood fibers, wadding, crepe paper, cellulose acetate fibers in irregular arrangement, and bird feathers were superior to ordinary cellulose acetate filters, while silica gels and ground glass were inferior.

Technical U., Vienna (Austria)
POTENTIAL FLOW'S ACCELERATION FIELD AROUND A CYLINDER, by Alfred Dobrowsky. [Final rept. pt. F, 1 Dec 58-30 Sep 59, on Behavior of a Streaming Aerosol and its Interaction with Solid Obstacles] Contract DA 91-591-EUC-1011. [16 Nov 59] 6p. AD-230 177.
Order from LC mi$1.80, ph$1.80 PB 148 307

Technical U., Vienna (Austria)
SCATTERING OF LIGHT IN COLLOIDS. THE PLOTNIKOW EFFECT, by Alfred Dobrowsky. [Final rept. pt. E, 1 Dec 58-30 Sep 59, on Behavior of a Streaming Aerosol and its Interation with Solid Obstacles] Contract DA 91-591-EUC-1011. [16 Nov 59] 10p. 4 refs. AD-230 175.
Order from LC mi$1.80, ph$1.80 PB 148 308

In the Tyndall-effect the incoming light is scattered by colloid particles. Generally the intensity of the scattered light is not sufficient to cause secondary scattering effects observable by the common means used. Using infrared light and colloids of larger particle size the secondary scattering effect dissipating over the whole colloid volume is easy to detect (Plotnikow - effect) by films for infrared light. In this paper a theory about the Plotnikow effect is advanced and the calculation for the intensity field is given and the connection between the Tyndall and Plotnikow effects is discussed. (Author)

EARTH SCIENCES

Danish National Committee of URSI.
THE CORRELATION BETWEEN EARTH CURRENTS AT GODHAVN AND MAGNETIC DISTURBANCES, by Eigil Ungstrup and Arne R. Pedersen. Technical note no. 1 on Contract AF 61(514)1309. 31 July 58, 7p. 1 ref. AFCRC TN-58-641; AD-231 805.
Order from LC mi$1.80, ph$1.80 PB 146 136

An investigation is presented of correlation between earth currents, as determined by orientating measurements at Godhavn during the months of August, September, and October, 1957, and geomagnetic disturbances. A distinct correlation is shown to exist between the daily variations (average values for a month) of the earth currents and the geomagnetic disturbances, the latter being expressed by the local K-index for Godhavn. A graphical representation of 3-hourly values of earth currents, local K-indices, and planetary K_p-values suggests a good correlation between all of these quantities. (Author)

Danish National Committee of URSI.
RESEARCH ON RELATIONSHIPS BETWEEN NATURAL ATMOSPHERIC RADIO PHENOMENA AND GEOMAGNETIC FIELD, by Jorgen Rybner and Eigil Ungstrup. Technical (Final) rept. on Contract AF 61(514)1309. July 59, 14p. 3 refs. AFCRC TR-59-275; AD-231 803.
Order from LC mi$2.40, ph$3.30 PB 146 135

The investigation consists in recording audio-frequency radio-wave phenomena at Godhavn, Greenland, in cooperation with the U.S. National Committee of U.R.S.I. at the request of the American Committee which has erected a chain of stations along the East Coast of America. The work consists in recording for two minutes every hour the electro-magnetic atmospherics of audio-frequencies by means of a special equipment consisting of an aerial, an amplifier, and a specially built tape recorder. The equipment has been built and designed at the laboratories of the Royal Technical University of Denmark.

Climatology and Meteorology

Air Force Cambridge Research Center [Bedford] Mass.
THE FEASIBILITY OF THE IDENTIFICATION OF HAIL AND SEVERE STORMS, by D. Atlas and R. J. Donaldson, Jr. Jan 55, declassified 6 May 60. 95p. 37 refs. Air Force Surveys in Geophysics no. 65; AFCRC-TN-55-21.
Order from LC mi$5.40, ph$15.30 PB 148 036

Some properties of hail felt to be important for its remote detection and identification have been discussed. A number of techniques for detecting and possibly identifying hail have been proposed: (1) Measurement of the difference in returned signal intensity between vertical and horizontal polarization. (2) Absolute echo intensity. (3) Echo intensity contour mapping of a suspected hail region. (4) Pulse-to-pulse echo fluctuations. (5) Detection of electrical activity in thunderstorms. (6) Geometry of the radar echo. Of the techniques listed, the polarization and echo fluctuation methods offer possibilities for uniquely identifying the presence of hail.

Air Force Cambridge Research Center [Bedford] Mass.
RESULTS OF CONTROLLED-ALTITUDE BALLOON FLIGHTS AT 50,000 TO 70,000 FEET DURING SEPTEMBER 1952, by Richard A. Craig and Thomas

O. Haig. Feb 53, 291p. Air Force Surveys in Geophysics no. 30; AFCRC-TR-53-4.
Order from LC mi$11.10, ph$45.60 PB 148 034

Army Signal Research and Development Lab., Fort Monmouth, N. J.
CALCULATOR FOR TEMPERATURE-HUMIDITY COMPUTATION, by Gwendolyn L. Killen and Leonard E. Evenson. 24 Nov 58, 29p. 4 refs. USASRDL Technical rept. 2010. AD-227 103.
Order from LC mi$2.70, ph$4.80 PB 147 995

Measurement of atmospheric humidity and temperature from aircraft using a stagnation-type measuring system with a resistance-type humidity sensor, such as humidity-temperature measuring set AN/AMQ-7 and humidity element ML-476( )/AMT, presents computational problems in reducing the readout data to true free-stream values. The theory, design criteria, and operation of a circular slide-rule type calculator designed to facilitate these computations are described. The device simply and effectively provides for a lock-in adjustment for the humidity sensor, conversion of the output function of this sensor to dewpoint temperature, and application of the necessary aerodynamic corrections to the indications from the measuring set. Pressure altitude and calibrated airspeed (or Mach number) are used in the computations. The final readout gives the true free-stream conditions of temperature and dewpoint temperature. The calculator is intended for use at aircraft speeds below Mach number 1.0. By modification of the appropriate scales, the design can be easily adapted for use with other equipments of similar design. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
AN EXPERIMENTAL PICTURE COMPARATOR FOR USE IN EVALUATING WEATHER RADAR SCOPE PHOTOGRAPHS, by Ewart F. Annet. 15 July 59, 12p USASRDL technical rept. 2057; AD-220 784.
Order from LC mi$2.40, ph$3.30 PB 148 114

Because of the importance of weather radar photographs in analyzing storms, there is a need for a device for rapidly comparing and evaluating many photographs of the same storm situation taken at various time intervals. A comparator is described and its limitations listed. An experimental refractive system which was developed is also described and its advantages listed. Results indicate that the comparator is not fully satisfactory and that work should continue on development of an improved refractive system. (Author)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
AIR TEMPERATURE AND PRECIPITATION ON THE GREENLAND ICE CAP, by Marvin Diamond. Oct 58, 13p. 16 refs. Research rept. 43.
Order from LC mi$2.40, ph$3.30 PB 148 469

Charts of mean annual air temperature and precipitation over the ice cap are constructed on the basis of snow-profile studies at 8 locations, data collected for several years after 1953 at two U.S. Air Force weather stations, and records from expeditions since 1930. The warming trend in the Arctic appears to have occurred to a lesser degree on the ice cap, possibly because of the effect of the snow cover. The lowest mean annual temperature in South Greenland is estimated to occur within the area bounded by the 2500 m contour and the -18C isotherm; mean annual temperature at 2700 is estimated as -20.9C. In North Greenland, the mean annual temperature at 1700 m is estimated at -22C. The presence of ice glands in the snow and daily max summer temperatures, estimated from records of coastal stations, indicate a potentially high incidence of melting at about 1300 m elevation and some melting at 1700 m in North Greenland, and melting up to 2700 m in the South. Annual accumulation is 2-3 times as great at 2500 m on the west side of the ice cap as at the crest. South of 66°N, precipitation may be about twice as great on the east side of the crest as in the west. (Author)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
INVESTIGATIONS OF FOG WHITEOUT, by Howard Reiquam and Marvin Diamond. July 59, 23p. 35 refs. Research rept. 52; AD-226 992.
Order from LC mi$2.70, ph$4.80 PB 148 471

The results of studies on the physical properties of fog whiteout, as it occurred at Site 2 on the Greenland Ice Cap in the summers of 1956 and 1957, are reported. The instruments, methods of measurement, and data-reduction techniques used are described. Attempts at dissipating whiteout by AgI seeding are discussed briefly. Emphasis was given to measurements of fog-particle size distribution, liquid-water content, relative humidity, visibility, and atmospheric nuclei. The synoptic situations for 2 selected cases of fog whiteout at relative humidities of less than 100% (possibly because of the presence of salt solutions) are described. The balance between the rate at which water is made available in the air as it is lifted over the Ice Cap and the rate of water flux to the snow surface is computed. Efforts at fog dispersal by AgI seeding from the ground were inconclusive. (Author)

Avco Corp., Wilmington, Mass.
RESEARCH CONCERNING FORECASTING ANOMALOUS PROPAGATION AT HIGH LATITUDES. ANOMALOUS foF2 VARIATIONS IN THE ANTARCTIC, by G. E. Hill. Scientific rept. no. 5 on Contract AF 19(604)4092. Apr 60, 43p. 7 refs. Technical rept. RAD-TR-60-13; AFCRC-TN-60-362.
Order from LC mi$3.30, ph$7.80 PB 147 658

The daytime minimum in the F2-layer critical frequency, which is often observed in the Antarctic, is explained on the basis of a vertical shear in the horizontal wind (neutral air) and the resulting movement of charged particles in the presence of the earth's magnetic field. The diurnal variation of the F2-layer critical frequency, as expressed by the noon minus the midnight value, D, is normally positive, but in the case of the daytime minimum, is negative. A three-level model of the F region has been developed for the purpose of demonstrating the effect of a vertical wind shear on the electron concentration. The results of electron-density computations for several cases have shown that the characteristic F2-layer

critical frequency variations can be explained on the basis of a wind shear of the order of 25 to 50 meters per second per 100 kilometers. The wind shear can account for most of the "anomalous" behavior in the Antarctic.

Minnesota U. School of Physics, Minneapolis.
METEOROLOGICAL STUDIES USING CONSTANT ALTITUDE BALLOONS, by Homer T. Mantis and William F. Huch. Technical rept. no. AP-14 on Atmospheric Physics Program, Contract Nonr-710(22). Aug 59, 69p. 12 refs.
Order from LC mi$3.90, ph$10.80 PB 147 696

In the course of a project to investigate the behavior of plastic balloons, a number of balloon flights were made in the upper troposphere with very accurate positioning and precise altitude control. These balloon flights yielded what is believed to be unique information on wind structure at intermediate scale. This report consists of three separate papers; the first is a description of the balloon system used for precise trajectories the second summarizes the information on wind structure at intermediate scale and the third reviews the work on the relationship between synoptic forces and constant altitude balloon trajectories.

Weather Forecasting Research Center, U. of Chicago, Ill.
STUDIES IN WEATHER ANALYSIS AND FORECASTING, ed. by Sverre Petterssen. Final rept. for 1957-1959, on Contract AF 19(604)2179. Feb 60, 507p. 18 refs. AFCRC TR-60-232; AD-234 282.
Order from LC mi$11.10, ph$77.40 PB 146 368

Contents:
The evolution of energy gain by the atmosphere through contact with the ground or ocean
Evaporation from the oceans
Outline of a project to investigate the effects of heat sources and sinks on the development of weather and motion systems
On the influence of heat exchanges on motion and weather systems (a short summary published by the National Academy of Sciences, vol. 45, no. 12, pp. 1655-1663, 1959, under the title "Heat exchange and weather forecasting"
On some weather influences due to warming of the air by the Great Lakes in winter
On the heat sources and sinks associated with mobile cyclones
Moisture analysis and water budget in some non-developing cases
Computation of precipitation from large-scale vertical motion
A meteorological coordinate system in which the earth's surface is a coordinate system
On summer cyclogenesis in western Canada associated with upper cold lows
An investigation of nighttime thunderstorms in the central United States
Investigation of cold waves at Chicago, Illinois
An investigation of the existence of an Aleutian low singularity
The thermal field of the arctic stratosphere near 80° W in January

Frost Science

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
DEEP CORE DRILLING IN ICE, BYRD STATION, ANTARCTICA, by R. W. Patenaude, E. W. Marshall, and A. Gow. July 59, 11p. Technical rept. 60; AD-227 121.
Order from LC mi$2.40, ph$3.30 PB 148 467

The preliminary results of core examinations and drill-hole temperature studies from Nov 1957 - Jan 1958 are reported, and the drilling equipment and techniques are described. Drilling was accomplished with a Failing model 314 rotary skid-mounted well-drilling rig with a 38-ft mast, powered by a 43-bhp Buda gasoline engine. Two types of bits, both cutting a 3 7/8-in. core and a 5 3/4-in. hole, were used. The speed of rotation was varied from 40-75 rpm, and the rate of penetration ranged from 2.5-10 in./min. Compressed air was used as the drilling fluid. Good quality cores were obtained down to 1013 ft with a 98% recovery. Examination of the cores revealed the presence of a detailed stratigraphic sequence down to a depth of 400 ft, consisting of alternating layers of coarse and fine-grained snow associated with ice bands 4 mm thick, which appeared singly or in closely spaced groups at regular intervals. Below this depth the ice was very homogeneous, except for thin ice bands which persisted to the bottom. The mean densities for meter increments to a depth of 150 ft, densities determined from spot samples at 5 points from 400-721.5 ft, and drill-hole temperatures down to 1000 ft are tabulated. (Author)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
FLEXURAL STRENGTH OF CLEAR LAKE ICE, by Robert D. Hitch. Master's thesis. July 59, 12p. 5 refs. Technical rept. 65; AD-231 914.
Order from LC mi$2.40, ph$3.30 PB 148 477

Values for the modulus of elasticity and strength of fresh-water lake ice in flexure were determined by laboratory experiments on 63 beams tested under various rates of loading at -5C and -20C. The results were obtained by measuring the center deflection of the test beam and the load simultaneously. Third point loading was used in order to develop a more favorable distribution of bending stresses in the middle third of the beam than with a simple beam. The experiments indicate that properties of ice vary according to loading rate, temperature, and crystal size. Specifically the results show: (1) lower temperatures give higher values of the modulus of elasticity and strength, (2) ice with larger crystals will have a higher modulus of elasticity but little difference in strength, and (3) the rate of loading increases the modulus of elasticity but has little effect on the strength except at low temperatures where higher strength values are obtained with a faster rate of loading. (Author)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
GLACIOLOGICAL INVESTIGATIONS IN THE THULE RAMP AREA, by Valter Schytt. Rept. on Northwestern U. Contract DA 11-190-eng-12. Apr 55, 93p. 5 refs. SIPRE rept. 28.
Order from LC mi$5.40, ph$15.30 PB 148 465

During the 1954 field season, from 19 June to 29 August, accumulation and ablation measurements were made on the Ramp and farther inland to Mile 20 (from Thule Take-off). Meteorological measurements were obtained for correlation with the glaciological work. Accumulation on the Ramp averaged 55 cm of snow and varied considerably, showing high values on concave slopes and low values on convex slopes. Farther inland, the order of magnitude of winter snow depths was 100 cm from Mile 4 to Mile 7; 150 cm from Mile 8 to Mile 14; and 100 cm from Mile 15 to Mile 20. Except for a narrow belt of winter accumulation just inside the edge of the glacier, the Ramp below 700 m belonged to the area with net ablation. Studies were made on formation of superimposed ice; debris features in the moraine area; and ice movement and structure in the vicinity of Thule Take-off. Some observations on trafficability of the route are included. (Author) (Also included in PB 146 024)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
INSTRUMENTATION OF ICE CAP STATIONS, by B. Lyle Hansen. Preliminary rept. Apr 55, 7p. SIPRE rept. 23.
Order from LC mi$1.80, ph$1.80 PB 148 462

Two stations on the Greenland Ice Cap were instru mented as follows: (1) copper resistance thermom eters were installed to determine the effect of the buildings on the subsurface temperatures; (2) a recording bench mark was installed and the elevations of selected points in the buidlings were determined by leveling from the bench mark; (3) reference points were established at which diameters of the tubes are measured and from which the orientation of the tubes can be determined by observations with a transit; and (4) various types of pressure cells were installed in order to determine some of the forces causing deformation of the buildings. (Author) (Also included in PB 146 024)

[Army] Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
PENETRATION OF SHAPED CHARGES INTO FROZEN GROUND, by Robert Benert. Apr 57, 23p. 3 refs. Technical rept. 45; AD-141 808.
Order from LC mi$2.70, ph$4.80 PB 148 470

Tests were conducted in 1955-56 at Fort Churchill (Man.) with 6 standard and experimental shaped charges to determine their usefulness in producing holes to receive explosives for the excavation of foxholes. The typical hole produced in sandy silt with a 12-in. peat cover consisted of a crater surrounding a narrow deep hole. Max. penetration depths ranged from 108 in. for the 40-lb M3 charge to 22 in. for the 2.75-oz Du Pont jet tapper. The M2 (10 lb). M2A3 (15 lb), and M3 met the min. hole-dimension requirements (5 ft deep by 2 in. wide); the 20-lb and 5-lb experimental charges were inadequate. Performance of the jet tapper indicated that further experiments with charges of this design are advisable. Buried boulders, though sometimes shattered by the jets, more frequently blocked them, and incomplete tests on natural ice indicated a relatively greater penetrability than the tests on frozen ground. The theory, methods, and equipment of the tests are described in detail, and the data obtained are tabulated and graphed. (Author)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
RADIATION MEASUREMENTS ON THE GREENLAND ICE CAP, by M. Diamond and R. W. Gerdel. Oct 56, 26p. 9 refs. Research rept. 19.
Order from LC mi$2.70, ph$4.80 PB 148 468

Measurements were made of global and net radiation between 6 July and 7 August 1955 at a site on the Greenland Ice Cap located near 78°N. latitude and at an elevation of 6800 ft. Diffuse sky radiation amounted to only 19% of all incoming global radiation measured at the Ice-Cap research site. Incident global radiation was reduced by 6% in the presence of a 0.5 cloud cover. The long-wave radiation balance at this site on the Ice Cap was always negative during the period covered by this study. Errors associated with the measurement of solar radiation at the low sun angles which prevailed at the research site were found to be about -3%. During periods of blowing and drifting snow, 6% more global radiation was measured at 1.25 m above the snow surface than at 5.7 m elevation. The atmospheric transmission coefficient at the Ice Cap site was found to be 0.968. The heat balance of the snow cover as computed from the radiation measurements and a temperature profile in the snow was found to be 7.6 ly/day at the Ice-Cap site. (Also included in PB 146 023)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
ROLE OF THE ELECTRIC DOUBLE LAYER IN THE MECHANISM OF FROST HEAVING, by L. A. Cass and R. D. Miller. Rept. on Cornell U. Contract DA-11-190-eng-23. Aug 59, 27p. 21 refs. Research rept. 49.
Order from LC mi$2.70, ph$4.80 PB 148 466

It is suggested that the osmotic activity of the electrical double layer on mineral particles can account for the heaving phenomenon in soils, and equations are given relating the osmotic pressure (and freezing temperature) of water at the base of a growing ice lens to overburden pressure, depth of water table, depth to the conducting stratum, hydraulic conductivity of soil, and rate of heave. Water flows to the ice face ordinarily by hydraulic conduction, but by diffusion in the unfrozen film between the upper-most particles and the underside of the ice lens. Coarse materials show little heave because of diffusion limitations on recharge of the unfrozen film. The theory of Jackson and Chalmers that super-cooling is required for heaving is denied, and a "solution model" is proposed in which heaving can occur in the absence of soil. Various methods of modifying or controlling

frost heaving are reviewed in the light of the theory, and experiments are proposed for evaluating the theory. (Author)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
SCIENTIFIC WORK OF PARTY CRYSTAL, 1954, by Carl S. Benson. Preliminary rept. Apr 55, 12p. SIPRE rept. 24.
Order from LC mi$2.40, ph$3.30 PB 148 463

Party Crystal, a small mobile scientific party, conducted snow studies during the summer of 1954 on the Greenland Ice Cap eastward from Thule, Greenland. Work included measurements of elevation, snow accumulation, summer melting, and snow properties. Final results of the season's work will be combined with the work of 1952 and 1953 and published at a later date. The average annual accumulation is approximately 60 cm of water equivalent for the first segment of the trail (58.5 mi); drops to 20 cm in the next 30 mi and remains low for approximately 45 mi; rises to nearly 40 cm for the next 85 mi; then decreases again to the east. Along the first 40 mi of the trail, the year's accumulation of snow becomes completely soaked during the melt season, making a very poor surface for vehicles. Beyond that point, the depth of soaking decreases rapidly. Ice masses due to percolation of melt water are very common and frequently large along the first 58.5 mi, decrease in size along the next 60 mi, and occur very infrequently farther east. (Author) (Also included in PB 146 022)

Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.
STUDIES ON VEHICULAR TRAFFICABILITY OF SNOW. PART II, by John J. Lanyon. July 59, 27p. 6 refs. SIPRE rept. 35.
Order from LC mi$2.70, ph$4.80 PB 148 460

The results are reported of investigations during the winters of 1955, 1956, and 1957 at the Keweenaw Field Station (Mich.) and in summer 1956 in N. Greenland to determine the relationship between certain meteorological parameters and the traffic-supporting capacity of snow cover. The vehicles used in the studies included an M-7 Ordnance snow tractor, a 4-pontoon Tucker Sno-Cat, and an M-29C weasel. A Bombardier Muskeg Tractor was modified and instrumented for use as a testing dynamometer vehicle. Max. drawbar pull for the M-7 tractor loaded with concrete blocks was obtained at a mean ground pressure of 1 psi. Max. efficiency of the tractor was between 10 and 20% slip. The efficiency coefficient of the Sno-Cat exceeded that of the M-7 tractor by 4%. Both face-angle grousers of the Kamm type and iron angle grousers of the same profile were tested on the track pads of the M-7 tractor. An increase of 30% in drawbar pull was obtained with supplemental grousers, but the overall results did not appear to justify the use of face-angle grousers. More tractive force was developed on the rear than on the front pontoons of the Tucker Sno-Cat. Tests in Greenland indicated that drawbar pull is directly related to both the density and hardness of the top 50 cm of snow. No relationship was found between air temperature and snow trafficability, drawbar pull and snow temperature, and snow hardness and density. (Author)

Dartmouth Coll., Hanover, N. H.
THE ABSORPTIVITY OF ICE: A CRITICAL REVIEW, by J. B. Lyons and R. E. Stoiber. Scientific rept. no. 3 on Contract AF 19(604)2159. 31 Oct 59, 14p. 22 refs. AFCRC-TN-59-656; AD-230 753.
Order from LC mi$2.40, ph$3.30 PB 146 195

The literature on ice absorptivity determination is critically evaluated in the light of new measurements. Clear flawless ice has transmissivities close to those of distilled water, with the infrared absorption bands offset slightly toward higher wavelengths. Bubbly ice, the variety commonly encountered in nature, has absorptivities in the range of 100 times greater than those for flawless ice; this effect is largely due to scattering. In the visible and near infrared range polycrystalline ice has transmissivities close to those for single ice crystals. The differential absorptivity for the e and o-rays is shown to be non-existent. (Author)

Villanova U., Pa.
ICE CONTROL ON AIRFIELD RUNWAYS, by G. N. Quam. Progress rept. on Contract NBy-4303. 30 Sep 56, 27p.
Order from LC mi$2.70, ph$4.80 PB 137 412

A particularly appealing method of controlling ice on airfields is to be able to push all the ice that forms off of the runways with an ordinary snowplow, roadscraper, or street sweeper. Accordingly, a search for a suitable coating that will almost eliminate adhesion of ice to the runway in being made. The adhesion of ice to a variety of coatings and other surfaces is being measured by both tensile and shear techniques. Attempts to synthesize ionic polymers, expected to be ice-phobic, are being made.

Geodesy

Chicago Aerial Industries, Inc., Melrose Park, Ill.
PRINTER, PROJECTION, PHOTOGRAPHIC EN-29A( ), by Carvyn Ellman, Gary Lynn and others. Final rept. on Contract AF 30(602)1750. Jan 59, 28p. RADC-TR-59-22; AD-210 722.
Order from LC mi$2.70, ph$4.80 PB 146 123

The EN-29A( ) Photographic Projection Printer, hereinafter referred to as an orthophotoscope, is an instrument used to convert perspective aerial photographs into a negative which, when printed, is the equivalent of an orthographic projection in which all horizontal distances appear in the same scale. Since the scale of an aerial photograph is constant only if the terrain has a constant elevation, objects on a variable elevation terrain that are of higher elevation appear larger than equal size objects of a lower elevation. Accurate scaling of aerial photographs is impossible.

Office of Technical Services, Dept. of Commerce, Washington, D. C.
PHOTOGRAMMETRY (SUPPLEMENT TO CTR-335). May 60, 7p. 92 refs. OTS Selective Bibliography 416.
Order from OTS $0.10 OTS SB-416

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations. Reports listed cover photogrammetry and aerial photography, as well as general research on maps and mapping.

Wharton School of Finance and Commerce, U. of Pennsylvania, Philadelphia.
A STUDY OF THE APPLICATION OF ELECTRONIC SCANNING AND COMPUTER DEVICES TO THE ANALYSIS OF GEOGRAPHIC PHENOMENA, by James P. Latham. Final rept. on Contract Nonr-551(29). 31 Aug 59, 6p. 1 ref. AD-227 256.
Order from LC mi$1.80, ph$1.80 PB 148 143

Progress is summarized in connection with the utilization of electronic scanning devices to measure and record the linear distance of the intercepts resulting when traverses sample a mapped distribution. Determinations were made which indicate the feasibility of scanning mapped, and aerially photographed, distributions in a manner which discriminates phenomena differentiated by gray tones or color. Capabilities of the flying spot scanner are summarized with reference to: (a) counting of the occurrences of a particular phenomenon within a scanned field; (b) counting occurrences by other phenomena with differentiating gray tone expressions; (c) performing above functions in one second for fields 4 1/2 x 4 1/2-in. by utilizing 1000 parallel scanning lines composed of 1000 elements each; (d) altering direction of scanning lines crossing field; and (e) reading out counts on display panels or printed tape. Modifications of the flying spot scanner is shown to increase capabilities with regard to measuring and counting the number of occurrences falling within diameter size classes, measuring and counting the intercepts by scanning lines with the occurrences of a phenomenon, and tripling the refinement of the scanning process.

Oceanography

Acoustica Associates, Inc., Plainview, N. Y.
TESTS OF ULTRASONIC INHIBITION OF MARINE GROWTH. Final rept. on Contract Nonr-2764(00). 11 Aug 59, 11p. Document DO-787; AD-226 998.
Order from LC mi$2.40, ph$3.30 PB 148 182

The effect of ultrasonic energy on the rate of marine growth was investigated. A stainless steel sonar dome was submerged in Biscayne Bay, Miami, Florida. An Acoustica, Model DR-500, 500-w ultrasonic generator and 2 Acoustica Model AT-1600 magnetostructive transducers provided the ultrasonic energy to the dome. Tests indicated that the attachment of marine growth on a stainless steel surface was not inhibited by the ultrasonic excitation in frequency region of 26 kc at any practical intensity level.

Chesapeake Bay Inst., Johns Hopkins U. [Annapolis, Md.]
BALTIMORE HARBOR CRUISES I - XVI, JULY 1958-NOVEMBER 1959. Dec 59, 222p. Data rept. 31; Ref. 59-4; AD-231 588.
Order from LC mi$9.90, ph$34.80 PB 146 275

Data were collected in the Baltimore Harbor and the adjacent area of the Chesapeake Bay during 16 survey cruises. The surveys were conducted to determine the distribution of temperature, salinity, and foreign waste acid in the area. The data furnish information on the rate of exchange of portions of Baltimore Harbor with each other and with the Chesapeake Bay. (Author)

Chesapeake Bay Inst., Johns Hopkins U. [Annapolis, Md.]
PHYSICAL AND CHEMICAL HYDROGRAPHY OF THE MAGOTHY RIVER, by D. W. Pritchard and R. E. Bunce. Rept. on Contract Nonr-248(20). Mar 59, 104p. 2 refs. Technical rept. 17; Reference 59-2.
Order from LC mi$5.70, ph$16.80 PB 146 343

The Magothy River is a tributary estuary of the Chesapeake Bay, located on the western shore of the Bay between the Patapsco River (Baltimore Harbor) to the north and the Severn River to the south. The name "river" is in fact a misnomer. The Magothy is a drowned valley of a small drainage system, with a water surface area of 8.74 square miles (statute) and a drainage area of 31.12 square miles. The entire Magothy estuary is shown, together with the land drainage area supplying fresh water run-off to the estuary. The length of the estuary, taken along the course of the channel from the mouth at Mountain Point to the head of tide, is 7.0 miles. The maximum width, which occurs in the vicinity of Sillery Bay, is 2.2 miles, though the width at the mouth is only 0.4 miles. As a result of the constricted entrance, tidal currents maintain a short scour channel at the mouth of the Magothy with a maximum depth of 40 feet. This scour channel extends less than 0.4 miles into the estuary, and depths within the Magothy are otherwise less than 20 feet. The 12 foot submarine contour has been entered on figure 2, and the depths at selected points along the channel are also indicated. The mean depth of the estuary is approximately 10 feet. (Author)

Engineer Corps, Washington, D. C.
TIDAL FLOW IN ENTRANCES, by John L. French. Jan 60, 68p. 20 refs. Technical bulletin no. 3, AD-232 302.
Order from LC mi$3.90, ph$10.80 PB 146 211

Two analytical studies are described. In the first, the methods of potential theory applied to the problem of determining the velocities in the approaches to a canal connecting an ocean with a lagoon or bay. Entrances with and without jetties extending into the ocean are considered. The streamlines are determined and velocities along the streamlines are given in a form suitable for simple application to engineering problems. In the second study, Tollomien's analyses for (1) the free jet boundary and (2) jet efflux from a linear slot are applied to the problem of the efflux of a 2-dimensional jet from a slot of definite width with particular reference to jet flow from a channel into a region of surrounding quiet water, such as an ocean. The literature was searched for appropriate experimental data, and the constant of Tollmien's theory is evaluated accordingly. The streamlines are determined, and velocities along the streamlines computed and presented in a manner susceptible of simple application to practical engineering problems. (Author)

National Research Labs, Ottawa (Canada).
THE N. R. C. PRESSURE-TYPE TIDE RECORDER, by E. H. Bowler. Jan 60, 40p. 1 ref. Mechanical engineering rept. MI-820.
Order from LC mi$3.00, ph$6.30 PB 147 736

This report describes a tide recorder, operable either from a battery or 115-volt 60-c. p. s. line power supply, suitable for use in remote locations (including the Arctic), for periods up to ten days without attention. The water level is determined by a hydrostatic pressure measurement with a submerged resistance potentiometer type transducer, which transmits a signal, through interconnecting cable, to a shore-based servo-balanced recorder. Atmospheric pressure variations and gravity wave effects are compensated in the system. Pressure accuracies of ±1/4 foot of water are achieved at temperatures down to +15°C and to ±1/2 foot to -20°C. (Author)

Naval Ordnance Test Station, China Lake, Calif.
FAST PHOTOGRAPHIC SPECTROPHOTOMETER FOR UNDERWATER USE, by Julian L. Thompson. 15 Feb 60, 19p. 6 refs. NOTS TP-2429; NAVORD rept. 7040.
Order from OTS $0.50 PB 161 774

An underwater photographic spectrophotometer has been constructed at the U. S. Naval Ordnance Test Station and tested for the direct measurement of the spectral composition of transmitted and scattered light at various ocean depths. By utilizing a wedge interference filter as the analyzing element, relatively high photographic recording speed and simultaneous recording of intensities throughout the visible spectrum have been achieved. The photometer has been tested to depths of 200 ft and has yielded data compatible with that published by others. Tests and design refinements are continuing toward the goal of eventual use at great depths. (Author)

Texas A. and M. Research Foundation, College Station.
OCEANOGRAPHY AND METEOROLOGY OF THE GULF OF MEXICO, by Hugh J. McLellan. Annual rept. for 1 May 57-30 Apr 58, on Contract N7onr-487(02). 1 May 58, 16p. 15 refs. Reference 58-7A.
Order from LC mi$2.40, ph$3.30 PB 146 333

Physics of the Atmosphere

Aeronutronic, Newport Beach, Calif.
ELECTRON CAPTURE IN THE IONOSPHERE BY DUST PARTICLES, by Raymond J. Munick and Robert T. Folk. Rept. on Contract AF 19(604)5486. 10 Mar 60 36p. 18 refs. Pub. no. U-823; AFCRC-TN-60-186
Order from LC mi$3.00, ph$6.30 PB 147 548

The dust particles rather rapidly acquire an equilibriun charge, which depends upon the balance between photoemission in the sunlight and the collection of positive ions and electrons. Available photoelectric current densities vary over so wide a range that charge of either sign can be acquired. This charging process provides a transitory increase or decrease of electron density. Positively charged particles have little effect on the electron density, but negatively charged particles continue to collect electrons in appreciable numbers. The general conclusion is that dust in amounts which can be raised by rocket can have significant effects upon the electron density of the ionosphere. (Author)

Allied Research Associates, Inc. [Boston, Mass.]
AN EVALUATION OF OZONESONDES, by Arnold H. Glaser, Frederic E. Hatch, and William Stevens, Jr. Final rept. on Contract AF 19(604)3493. 29 Feb 60, 96p. 97 refs. AFCRC-TR-60-243.
Order from LC mi$5.40, ph$15.30 PB 147 557

Available sounding instruments capable of measuring atmospheric ozone are evaluated to ascertain their suitability for use on a semiroutine basis over an extended network. The Paetzold Ozonesonde is an optical instrument which determines the amount of ozone between the sonde and the sun by differential absorption of two ultraviolet wave lengths. The Mast Ozonesonde is an American adaptation of the successful Brewer chemical sonde. The Regener Ozonesonde carries the standard potassium iodide-sodium thiosulfate titration of ozone into sonde form. Further development of any of these sondes seems to be required for extended network use. It would appear that the required development can most readily be accomplished with the Paetzold principle.

Army Signal Research and Development, Fort Monmouth, N. J.
DOUBLE THEODOLITE WIND-MEASURING SET FOR ROCKETS, by A. C. Barichivich, A. E. Weisner and others. 15 Mar 59, 87p. 4 refs. USASRDL Technical rept. 2019; AD-217 543.
Order from LC mi$4.80, ph$13.80 PB 146 265

A double theodolite wind set that provides a low-level wind measurement weighted for rockets was developed. Operational and computational procedures are given. An error analysis was performed, and estimates are presented of set errors under field conditions. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE MEASUREMENT OF TEMPERATURES, DENSITIES, PRESSURES, AND WINDS OVER FORT CHURCHILL, CANADA, BY MEANS OF THE ROCKET GRENADE EXPERIMENT, by W. R. Bandeen, R. M. Griffith and others. 2 Nov 59, 71p. 13 refs. USASRDL technical rept. 2076; AD-228 466.
Order from LC mi$4.50, ph$12.30 PB 147 998

Ten successful Aerobee rocket firings carrying the Signal Corps-University of Michigan rocket-grenade experiment were conducted at Fort Churchill, Manitoba, Canada (59°N). One hundred and fifty-three values of temperatures and winds between 25 and 94 km were measured in summer and winter, both during the day and at night, using the improved tracking and sound-ranging techniques required to make the grenade experiment an all-weather experiment. New facts about the arctic upper atmosphere were revealed. Temperatures in winter are unexpectedly high above

60 km with a second temperature maximum occurring between 70 to 80 km. Summer temperatures as low as 165°K at 80 km were recorded. The temperature maximum lies at about 50 km and in summer is greater than in White Sands, while in winter these temperatures are lower. Densities and pressures were also calculated from these data. The winds show a pattern similar to that in the middle latitudes: strong and westerly in winter, weaker and easterly in summer. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
UPPER ATMOSPHERE ROCKET SOUNDINGS ON THE ISLAND OF GUAM (IGY PROJECT 10.18) by W. Nordberg. 2 Nov 59, 142p. 9 refs. USASRDL technical rept. 2078; AD-228 443.
Order from LC mi$7.20, ph$22.80 PB 147 999

The performance of the rocket-grenade experiment on Guam during November 1958 is reviewed. Nine rockets (6 Nike-Cajuns and 3 Aerobee 75's) were launched successfully. A total of 43 data points, each representing one value for temperature, wind speed, and direction, was obtained. The measurements were spread over the period between local sunset and sunrise and cover an altitude range from about 30 to 80 km. Radiosonde data below 30 km are available. (Author)

Denver U., Colo.
INSTRUMENTATION FOR BALLOON-BORNE INFRARED SPECTRAL TRANSMISSION MEASUREMENTS OF THE ATMOSPHERE, by David G. Murcray, James N. Brooks and others. Scientific rept. no. 3 on Contract AF 19(604)2069. 8 Feb 60, 28p. 5 refs. AFCRC-TN-60-264.
Order from LC mi$2.70, ph$4.80 PB 147 648

Balloon-borne instrumentation for recording atmospheric absorptions of the near infrared from 1μ to 15μ is described and the performance of this equipment on several flights is discussed. (Author)

Denver U., Colo.
A STUDY OF THE 1.4u, 1.9u AND 6.3u WATER VAPOR BANDS AT HIGH ALTITUDES, by David G. Murcray, Frank H. Murcray and others. Scientific rept. no. 4 on Contract AF 19(604)2069. 18 Feb 60, 33p. 8 refs. AFCRC-TN-60-265.
Order from LC mi$3.00, ph$6.30 PB 147 647

On March 13, 1959, the infrared solar spectrum from 1 to 10μ was recorded at altitudes up to 90,000 ft by means of a balloon-borne spectrometer flown in conjunction with a biaxial pointing control. The amount of water vapor present at these altitudes was also measured by means of a frost point hygrometer. The absorptions were calculated for the 1.4μ, 1.9μ and 6.3μ bands using both expressions, the hygrometer data and the laboratory data of Howard et al. Comparison of the calculated and observed absorptions indicates that the expression using $u_e = \int_{h_1}^{h_2} \left(\frac{p}{p_s}\right)^k \rho \, dh$ gives better agreement with the observed values.

Ionospheric Research Lab., Pennsylvania State U., University Park.
VERTICAL INCIDENCE EQUIVALENT HEIGHT RECORDING AT 75 KC/S, by D. J. O'Brien and W. J. Ross. Scientific rept. no. 110 on Ionospheric Research, Contract AF 19(604)3875. 1 Sep 58, 94p. 6 refs. AFCRC-TN-58-637.
Order from LC mi$5.40, ph$15.30 PB 138 261

The results of vertical incidence pulse sounding of the ionosphere at 75 kc/s from October 1955 to February 1957 are presented in tabular form. Median curves are drawn and discussed briefly. Comparisons are made with the records taken previously at 150 kc/s. The main classes of complex echoes are shown and discussed briefly and compared with similar records at 150 kc/s. (Author)

Johns Hopkins U., Baltimore, Md.
THE FIRST AND SECOND POSITIVE BANDS OF N_2, by G. H. Dieke and D. F. Heath. Rept. on Contracts AT(30-1)-1447 and AF 19(604)5516. Dec 59, 194p. 30 refs. Spectroscopic rept. no. 17; AFCRC-TN-60-230; AD-233 489.
Order from LC mi$8.70, ph$30.30 PB 146 250

The first and second positive groups of N2 were photographed with a low pressure discharge cooled with liquid nitrogen and better resolution achieved than in previous work. The rotational analysis of 21 bands of the first and 9 of the second positive group has yielded the energy levels of $A^3\sum$ to $v = 12$, of $B^3\Pi$ to $v = 18$ and of $C^3\Pi$ to $v = 4$ to within about 0.01 cm^{-1} relative to each other and to within about 1 cm^{-1} with respect to the normal state of the molecule. With these levels the lines in all other bands can be calculated to within the limits of experimental errors. In the second positive group a number of weak satellite branches were found that have not been observed before. Exposures at higher temperatures and an afterglow in argon yielded more information about the perturbations of the $C^3\Pi$ state. The anomalous intensities in these perturbations were interpreted as abnormal occupation of the upper states rather than abnormal transition probabilities. The deviations from thermal equilibrium promise interesting information about the excitation mechanism of the second positive group. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
MEAN ABSORPTION COEFFICIENTS OF AIR, NITROGEN, AND OXYGEN FROM 22,000° TO 220,000°, by B. H. Armstrong. 15 July 59, 81p. 2 refs. LMSD-49759; AD-225 756.
Order from LC mi$4.80, ph$13.80 PB 147 677

The results of calculations of mean electromagnetic radiation absorption coefficients and of the ionic composition of nitrogen, oxygen, and air are described, and graphs of the results presented. The temperature range of the calculations is 2 to 20 ev, and the density range is approximately 10^{-8} to 10^{-2} gm/cm. (Author)

Michigan U. Coll. of Engineering, Ann Arbor.
FALLING-SPHERE INSTRUMENTATION DEVELOPMENT, by J. W. Peterson, D. A. Robinson, and H. F. Schulte. Final rept. on Contract AF 19(604)2415. Feb 60, 87p. 9 refs. 2649-9-F; AFCRC-TR-60-247.
Order from LC mi$4.80, ph$13.80 PB 147 762

Work on the continuing development of the falling-sphere technique for measuring upper-air density and temperature is described. The factors limiting the performance of the transit-time accelerometer were investigated, and a design concept was reached which, it is anticipated, will improve the performance. The data-reduction process for the sphere experiment was completely computerized and is reported. An investigation of the phenomenon of antenna breakdown in flight is described. (Author) (See also PB 143 040)

Stanford Research Inst., Menlo Park, Calif.
IONOSPHERIC ABSORPTION INVESTIGATIONS AT HAWAII AND JOHNSTON ISLAND, by A. Fredriksen and R. B. Dyce. Scientific rept. no. 1 on Contract AF 19(604)3462. Jan 60, 17p. 3 refs. AFCRC TN-60-136; AD-233 726.
Order from LC mi$2.40, ph$3.30 PB 146 325

Measurements of ionospheric absorption by the cosmic-noise monitoring method show that, at certain tropical latitudes, an irregular component of absorption is often present in the evening hours. If the variable absorption is present at one observing site (Johnston Island), then variations are also likely to be present at another station about 1325 kilometers away (Hawaii). However, the individual variations of absorption as a function of time are not correlated at the two stations, suggesting that the scale of the patches causing the absorption must be less than about 1000 kilometers.

ENGINEERING

Brown U. Div. of Applied Mathematics, Providence, R. I.
LIMIT STRENGTH OF THIN WALLED PRESSURE VESSELS WITH AN ASME STANDARD TORISPHERICAL HEAD, by R. T. Shield and D. C. Drucker. Technical rept. no. 31 on Contract Nonr-562(10). Feb 58, 27p. 8 refs. C11-31.
Order from LC mi$2.70, ph$4.80 PB 138 132

Results are presented for the maximum pressure an unfired vessel with an ASME standard torispherical head can withstand before appreciable plastic deformation will occur. The effect of flanges on strength is considered. Although the procedures outlined permit variation of pressure in the axial direction to be taken into account fully, for convenience the calculations are based upon the assumption of uniform interior pressure. Work-hardening is not of much significance for thin-walled vessels of the usual steels and is ignored.

Aeronautical Engineering

Aeronautical Accessories Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
THE RESPONSE OF MECHANICAL SYSTEMS TO RANDOM VIBRATION AS DETERMINED BY ANALOG COMPUTER, by Virgil Clinton McIntosh. Rept. on Environmental Simulation Methodology. Feb 60, 49p. 9 refs. WADC Technical note 59-193.
Order from OTS $1.25 PB 161 794

This report is concerned with the determination of the responses of mechanical systems to random vibration. Systems are chosen which are difficult or impractical to analyze by analytical methods but which may be conveniently analyzed by an electronic analog computer. The responses of nonlinear single-degree-of-freedom systems and linear two-degree-of-freedom systems to both random and sinusoidal vibration are determined, and the inputs required to produce equal root-mean-square responses are compared. For the three types of nonlinearities studied, increasing the nonlinearity causes the rms response to a random input to increase relative to the response to a sinusoidal input. In a two-degree-of-freedom system, varying the mass ratio or the damping ratio causes similar effects in the response to either sinusoidal or random inputs. (Author)

Air Force Cambridge Research Center [Bedford] Mass.
THE SUPPRESSION OF AIRCRAFT EXHAUST TRAILS, by C. E. Anderson. Nov 54, declassified 18 Jan 57. 43p. 18 refs. Air Force Surveys in Geophysics no. 58; AFCRC-TN-54-24.
Order from LC mi$3.30, ph$7.80 PB 148 035

The suppression of contrails appears to be possible theoretically by controlling the amount of water in the exhaust gases. From an examination of the effect such control systems would have on engine performance, it does not seem possible to restrict the water without serious interference. Present trends in turbo-jet engineering offer little hope in the way of increased temperature/water ratio in the exhaust gases, at least for the next ten years. A possible solution may be the development of methods to control the size and number of condensation particles.

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
CRITERIA FOR DESIGNING RUNWAYS TO BE SURFACED WITH LANDING MAT AND MEMBRANE-TYPE MATERIALS, by A. B. Thompson and C. D. Burns. Apr 60, 88p. 1 ref. Technical rept. no. 3-539.
Order from LC mi$4.80, ph$13.80 PB 147 738

Accelerated traffic tests simulating aircraft taxiing operations were conducted on test sections, having a range of subgrade and base course strengths, that represented unsurfaced or membrane-surfaced airstrips and runways surfaced with standard M6, M8, and M9 landing mat. Load carts applied traffic simulating single-wheel loads of 10,000 to 50,000 lb (tire pressures of 40 to 300 psi) and multiple-wheel assembly loads of 50,000 and 100,000 lb. CBR, water content, and density of base and subgrade before and during traffic, and behavior of the test sections were recorded. Traffic continued until test section failed or until 700 coverages had been completed. Design curves, developed by applying the test data to bituminous pavement design curves, are considered adequate for use in designing landing strips surfaced

with M6 or M8 mat, and for properly fabricated M9 mat. Curves applicable for unsurfaced or membrane-surfaced strips, and curves for estimating surface-strength requirements for 1 to 100 coverages of such strips were also developed. (Author)

Army Ordnance Human Engineering Labs., Aberdeen Proving Ground, Md.
DETECTION OF RANDOM LOW-ALTITUDE JET AIRCRAFT BY GROUND OBSERVERS, by William Wokoun and Otho C. Wolfe. June 60, 56p. 6 refs. Technical memo. 7-60.
Order from LC mi$3.60, ph$9.30 PB 147 962

This study investigated the efficiency of the human ground observer in detecting and identifying jet fighter aircraft, as a function of size of sector observed and aircraft altitude, when targets appeared essentially at random. Particular emphasis was place on allowing the subjects minimal information about when and where aircraft might appear. The evaluation included four search sector sizes (360°, 180°, 90°, and 45°). Three types of jet aircraft (T-33, F-86, and F-100) approached along six courses at two altitudes (500 and 1500 feet). Results include cumulative probability curves indicating the likelihood that aircraft will be detected or identified at any given distance for the various combinations of search sector size and altitude, as well as supplementary analyses of day-to-day variations in detection efficiency, the effect of intertrial interval, variation due to aircraft course and terrain, variation due to cross-over range, and accuracy of identification. (Author)

Bell Helicopter Corp., Fort Worth, Tex.
PERFORMANCE AND WEIGHT AND BALANCE SUBSTANTIATION FOR THE TWO-PLACE OBSERVATION HELICOPTER STUDY, by A. Shultz and G. Osborne. Rept. on Contract DA 44-177-tc-420. 30 Sep 57, declassified 28 Apr 58, 75p. 8 refs. Rept. no. D233-099-002.
Order from LC mi$4.50, ph$12.30 PB 146 337

This report presents the methods and analysis used for performance and weight evaluation of the Two-Place Observation Helicopter Study. (See also PB 146 338)

Bell Helicopter Corp., Fort Worth, Tex.
TWO-PLACE OBSERVATION HELICOPTER DESIGN STUDY, by John A. DeTore. Summary rept. on Contract DA 44-177-tc-420. 29 Oct 57, declassified 28 Apr 58, 118p. Rept. no. D233-099-001.
Order from LC mi$6.00, ph$18.30 PB 146 338

This report summarizes the results of the design study of inexpensive, lightweight, helicopters to meet the Army Two-Place Observation Helicopter requirements. The following three solutions are discussed in detail. (1) A modified H-13H helicopter powered by a Lycoming VO-435 piston engine derated to 200 hp. Gross weight is 2256 lbs. (2) The D233, a smaller helicopter, having a 28 ft diameter rotor and powered by a Lycoming O-360 piston engine rated at 180 hp - NRP. Gross weight is 1693. (3) The D234, a still smaller helicopter, having a 25 ft diameter rotor and powered by a Lycoming PLT 11E-1 free turbine engine rated at 233 hp - NRP. Gross weight is 1637 lbs.

Bolt, Beranek, and Newman, Inc., Cambridge, Mass
PERFORMANCE OF INTENSE ACOUSTIC FACILITY FOR FLIGHT VEHICLE AND ELECTRONIC RESEARCH, by George W. Kamperman, Clayton H. Allen and others. Rept. for May-Oct 59 on Aeroelasticity, Vibration and Noise, Contract AF 33(616)5274. Mar 60, 42p. WADD Technical rept. 59-12.
Order from OTS $1.25 PB 161 781

A unique sonic failure research facility has been constructed for testing flight vehicle structures and electronic systems in the presence of high intensity sound. The siren sound source will produce pure tones or narrow bands of noise throughout the frequency range from 50 to 10,000 cps with controlled amplitude modulation from 0 to 50 cps. The maximum acoustic power output is 22,000 w to produce a sound pressure level of approximately 174 db in the 1 ft square progressive-wave test section. This report discusses the performance of the facility. (Author)

Cook Research Labs., Morton Grove, Ill.
A STUDY TO INVESTIGATE ALL PROBLEMS RELATED TO A TACTICAL HIGH DENSITY LANDING SYSTEM FOR THE PURPOSE OF RECOMMENDING A SYSTEM WHICH WILL FULFILL THE ARMY'S REQUIREMENTS IN 1962, by R. T. Brumbaugh. Quarterly progress rept. no. 1, 15 June-1 Dec 59, on Contract DA 36-039-sc-84513. [1959] 29p. P-1842.
Order from LC mi$2.70, ph$4.80 PB 147 413

This report deals with the preliminary investigation of the operating environment which may be expected for Army air operations in the post-1962 tactical situation. From this investigation the requirements for an Interim High Density Landing System will be resolved. Principal requirements of the system will be the ability to land two aircraft per minute, the capability to handle all types of Army aircraft, and all-weather operation. Concern is given to the various situations which may be encountered as well as the various aircraft and electronic equipments which may be employed. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
BOUNDARY-LAYER DISPLACEMENT AND LEADING-EDGE BLUNTNESS EFFECTS IN HIGH TEMPERATURE HYPERSONIC FLOW, by H. K. Cheng, J. Gordon Hall and others. Rept. on Contract AF 18(603)10. Jan 60, 82p. 66 refs. Rept. no. AD-1052-A-9; AFOSR TN-59-1193; AD-233 867.
Order from LC mi$4.80, ph$13.80 PB 146 370

Two important features of hypersonic flow over slender or thin bodies are the displacement effect of the boundary layer and the large downstream influence of leading-edge bluntness. The present paper contributes new theoretical and experimental results on this problem.

Lockheed Aircraft Corp. [Burbank, Calif.]
HIGH ENERGY RATE METAL FORMING, by A. F. Watts and Glen N. Rardin. Interim technical engineering rept. no. 7, 1 Oct-31 Dec 59, on Contract AF 33(600)35543. [1960] 17p. LR 14204; AD-231 387.
Order from LC mi$2.40, ph$3.30 PB 146 287

The hoop stresses induced in the walls of a small water filled explosive forming tank with various insulating materials are presented. Air, as an energy absorbing medium, was found to be the most effective. (Author) (See also PB 144 411)

National Research Labs., Ottawa (Canada).
A COMPARISON BETWEEN THE SPANWISE AND CHORDWISE SHEDDING METHODS OF ROTOR BLADE DE-ICING, by J. R. Stallabrass and G. A. Gibbard. Jan 60, 39p. 4 refs. Aeronautical rept. LR-270.
Order from LC mi$3.00, ph$6.30 PB 147 504

Flight tests in an artificial icing cloud were made on two sets of helicopter rotor blades equipped with deicing heater mats embodying the spanwise and chordwise shedding principles. The tests demonstrated a decided performance advantage for the spanwise shedding systems, although the chordwise shedding system had the advantage of greater constructional simplicity. (Author)

National Research Labs., Ottawa (Canada).
THE ICING OF DELTA WINGS OF UNITY ASPECT RATIO HAVING LEADING EDGE SEPARATION, by C. K. Rush. Dec 59, 40p. 6 refs. Aeronautical rept. LR-268.
Order from LC mi$3.00, ph$6.30 PB 147 537

Tests were made in an icing wind tunnel of two models, and the resulting ice formations are described and illustrated. The significance of scale is discussed, and it is shown that the tests are representative of icing conditions with large droplets and high speeds. (Author)

National Research Labs., Ottawa (Canada).
TURBOJET THRUST AUGMENTATION: FLIGHT MEASUREMENTS OF THE TURBINE BLADE COOLING ACCOMPANYING THE PRE-TURBINE INJECTION FUEL WITH AN ORENDA 14 ENGINE IN A SABRE 6 AIRCRAFT, by E. P. Cockshutt, G. G. Levy, and C. R. Sharp. Jan 60, 47p. 5 refs. Aeronautical rept. LR-271
Order from LC mi$3.30, ph$7.80 PB 147 333

Turbine blade temperature data, obtained with a thermocouple-slipring instrumentation system, are presented for an Orenda 14 engine, which was flight tested both with and without reheat at altitudes ranging from 20,000 to 50,000 feet. The blade temperatures in the unreheated engine were found to be determined primarily by the variation in the turbine outlet (gas) temperature with flight condition. The first-stage turbine blades were cooled by the preturbine injection of the reheat fuel by a maximum of 150°C under sea-level-static conditions; as had been predicted from simple heat transfer theory, the maximum cooling declined to about half this value at 50,000 feet. No significant cooling of the second-stage turbine blades was detected at any flight condition. The instrumentation system operated without serious difficulties throughout the test program. (Author)

Naval Air Development Center, Johnsville, Pa.
UNDERWATER ESCAPE PROGRAM: TESTS OF F8U-1 PILOTS' SURVIVAL EQUIPMENT FOR POSSIBLE USE IN NAVDEVCEN AUTOMATIC DITCH SYSTEM, by Daniel L. Lorch. Rept. on TED Proj. ADC-AE-6307. 2 Oct 58, 15p. 8 refs. NADC-ED-5828; AD-231 390.
Order from LC mi$2.40, ph$3.30 PB 147 493

The F8U bailout oxygen system with the modified Firewel Regulator (1732-3) and the MK-3C life preserver were tested to determine if this equipment might be utilized in an automatic water-crash escape system now under consideration. The tests indicate that this equipment is satisfactory for underwater escape from a depth of 100 feet. (Author)

Sikorsky Aircraft Div., United Aircraft Corp., Stratford, Conn.
REDUCTION OF EXTERNAL NOISE OF A YH-19 HELICOPTER, SERIAL NO. 49-2015A EQUIPPED WITH A PRATT & WHITNEY R-1340 ENGINE, by E. R. Wood. Rept. on Contract Nonr-1773(00). 31 Dec 57, 113p. Rept. no. SER-55034.
Order from LC mi$6.00, ph$18.30 PB 146 180

An investigation of the external noise field of a YH-19 helicopter including a study of methods and operational techniques by which this noise can be reduced or masked. (Author)

Chemical Engineering

Army Chemical Warfare Labs., Army Chemical Center, Md.
INVESTIGATION OF A LONG-BURNING PLASTIC-BONDED, COLORED-SMOKE MIXTURE, by Woodrow W. Reaves and John H. Hassmann. Jan 60, 22p. CWLR 2339; AD-233 750.
Order from LC mi$2.70, ph$4.80 PB 147 627

The object of the work described in this report was to develop a long-burning, plastic-bonded, colored-smoke formulation that could be adapted for use in the Naval Floating Drift Signal, Mark 7. Various polyester resins were investigated for use as binders and fuels for pyrotechnic smoke mixtures. Mixtures capable of extrusion into various configurations were investigated to obtain longer burning times. (Author)

Battelle Memorial Inst., Columbus, Ohio.
EVALUATION OF THE ZONE-PURIFICATION PROCESS AS A METHOD OF PREPARATION OF PORTABLE WATER FROM SEA WATER, by R. C. Himes, S. E. Miller and others. Rept. on Contract no. 14-01-001-80. May 60, 32p. Office of Saline Water Research and Development rept. no. 36.
Order from OTS $1.00 PB 161 818

Experimental evidence has definitely linked periodic salt entrapments (characteristically observed along ingots grown in this research program) with breakdown of constitutional supercooling. The shape of the solid-liquid interface and crystallization rates at various solution concentrations are important factors in the zone

refining and directional freezing of salt water. Crystallization-rate studies have established an upper limit for the growth rate of ice crystals from salt solutions. The technical feasibility of multiple-stage zone-freezing conversion of sea water has been demonstrated. Preliminary engineering evaluation of several multiple-stage, continuous freezing systems has indicated that at least one may be economically feasible.

Blaw-Knox Co., Pittsburgh, Pa.
SALINE WATER CONVERSION BY DIRECT FREEZING WITH BUTANE, by George Karnofsky and Paul F. Steinhoff. Rept. for 29 June-30 Oct 59 on Contract no. 14-01-001-176. 1 July 60, 78p. Office of Saline Water Research and Development Progress rept. no. 40.
Order from OTS $2.00 PB 161 819

This report includes an engineering study, and laboratory work on which the study is based, of a plant to produce 10,000,000 gallons per day of fresh water from sea water. The process is that of direct freezing brought about by the evaporation of a hydrocarbon refrigerant (butane) in contact with sea water; washing the ice free of saline liquor; and melting the ice to potable water by the condensation of butane vapor. The results of the engineering study showed that the total cost, conservatively estimated for a plant based on electric motor drive, is $10,524,000, and the corresponding cost of producing fresh water is 55.5 cents per 1000 gallons. For a plant based on gas engine drives for the compressors, the capital investment is $11,874,000, and the cost of water produced is 50.7 cents per 1000 gallons.

Massachusetts Inst. of Tech., Cambridge.
THE EVAPORATION OF WATER AT HIGH HUMIDITIES, by Thomas K. Sherwood and Oliverio Phillips. (Doctoral thesis). Final rept., Part III, on Mass Transfer into Gas Streams at Low Pressures and High Velocities, Contract DA 19-020-ORD-3244. 15 Apr 57, 233p. 87 refs. OOR rept. no. 887 4C; AD-133 277.
Order from LC mi$10.20, ph$36.30 PB 147 856

An investigation was made of the factors by which changes in concentration of the diffusion compound affect the rates of mass transfer between a gas and a wet surface. A 2-ft-long, 0.813-in.-id glass wetted-wall tower and a kieselguhr porous wet cylinder 0.658 in. in diameter and 1.069 in. long were used to study the evaporation of water into steam-air mixtures. The results obtained in both the wetted-wall tower and the wet cylinders indicated that concentration changes affect the turbulent and molecular transfer processes and confirm the inverse proportionality between k_G and p_{BM}. A theoretical discussion of diffusion in the evaporation process is presented. Negligible liquid film resistance to mass transfer in the wetted-wall tower was observed.

Civil Engineering

[Army] Engineer Research and Development Labs., Fort Belvoir, Va.
INVESTIGATION OF THE ADEQUACY OF CONSTRUCTION EQUIPMENT AND TECHNIQUES UNDER ARCTIC WINTER CONDITIONS FOR ROADS AND AIRFIELDS CONSTRUCTION PURPOSES, by Paul A. Beigbeder and Stanley H. Robertson. 2 Nov 54, 46p. 1 ref. Rept. 1380; AD-67 311.
Order from LC mi$3.30, ph$7.80 PB 148 052

An investigation was conducted (1) to develop a suitable cross section for use in constructing expedient roads and airfields during the winter in permafrost regions using frozen road materials; and (2) to determine the limitations of the available equipment in excavating and placing frozen road materials. Traffic tests were conducted on 5 test lanes which were constructed with frozen soils excavated from 2 borrow pits. Sieve and water (ice) analyses were carried out and thermocouples were installed in the test lanes. Meteorological data were recorded. Results indicate that (1) frozen borrow material cannot be loosened and disaggregated sufficiently and economically by explosives to satisfy the requirements of handling and placing without additional processing; (2) the most expedient method for loosening frozen gravel in the borrow pits was by rooters; (3) the available rooting equipment was inadequate for excavating frozen silty soils; (4) the most suitable method for hauling and placing fill material in the roadway was by trucks; (5) the most expedient method of loading trucks was by dipperstick shovel from stockpiles; (6) the sheepsfoot roller and the wobble-wheel roller were ineffective in compacting or disaggregating frozen gravel material; (7) the need for material such as logs, landing mats, brush, and the like, to support a fill was not required (provided the muskeg was in a frozen state); and (8) a 6-ft gravel fill on a frozen muskeg will keep the muskeg at a freezing temperature, or slightly above, for a shallow depth during thaw periods.

Bureau of Yards and Docks, Washington, D. C.
MAINTENANCE MANAGEMENT OF PUBLIC WORKS AND PUBLIC UTILITIES. Dec 59, 144p. NAVDOCKS P-321.
Order from LC mi$7.20, ph$22.80 PB 147 656

This publication has been prepared as an aid for naval and civilian personnel concerned with the maintenance management of public works and public utilities at shore activities of the Naval Establishment. Controlled Maintenance, as outlined in this publication, is the application of proven management and industrial engineering principles to the maintenance and operation of public works and public utilities. The significance of Controlled Maintenance is explained, as are the basic concepts, elements of control, and extent of control. Also included are procedures and other criteria to assist in the implementation of Controlled Maintenance.

Electrical and Electronic Engineering

Aero Service Corp. [Philadelphia, Pa.]
MAP DEVELOPMENT FOR ADVANCED RADAR SIMULATION TECHNIQUES, by Walther Barth. Rept. on Contract AF 33(600)31911. Feb 60, 83p. 36 refs. WADC Technical rept. 58-165.
Order from OTS $2.25 PB 161 795

Five basic considerations are treated separately as individual reports. The first describes and develops arithmetic progressions for densities, transmittances

and opacities, and calculates the densities sequences required, relating them to practical densities. An overlay is developed for use on the sensitometric curve, to obtain the progression of transmittances or opacities. In the second report the Densitometer is described and methods of use to eliminate errors are explained. The method of measuring densities on the photographic plate type map is described. The third report describes the method of development and fixing used for the photographic plate to achieve uniformity. The fourth report describes a method of obtaining a predetermined gray scale by paint mixing, in which is described an improved mixing sequence termed the Successive Mixing Method, which aids in eliminating errors and results in greater uniformity of the gray scales. The fifth report discusses the errors affecting the photographic reproduction and describes the principles for compensating variations in the reproduction and describes the principles for compensating variations in the reproduction. An emulsion is recommended which has the density range within the straight line portion of the sensitometric curve. (Author)

Aeronutronic, Newport Beach, Calif.
TELEMETRY SYSTEM STUDY. VOLUME I (of III). ANALYSIS AND DESIGN, by J. G. Hammond, W. F. Link and others. Final rept. v. 1, 6 Feb 57-30 Nov 59, on Contract DA 36-039-sc-73182. 18 Dec 59, 283p. [30] refs. Publication no. U-743.
Order from LC mi$11.10, ph$44.10 PB 147 919-1

A telemetry system study has been conducted to evaluate both experimentally and analytically the performance capability and potential of standard systems and to provide a design plan for an improved telemetry system. The results of the program are reported in three volumes. Volume I contains an analysis of each of the four basic systems: PCM-FM, PDM-FM, FM-FM, and PAM-FM. The analyses have been developed and verified experimentally to provide a means for determining the performance of each of the systems and to permit system parameters to be adjusted for optimum performance. The criteria for comparing the relative performance of the several systems are derived and the comparisons are presented. It is shown that PCM-FM and PAM-FM are superior to PDM-FM and FM-FM for the majority of anticipated applications. A conceptual design of a system which is recommended for development is described. Basically, the system employs a combination of PAM-FM and PCM-FM techniques in a configuration which enables the telemetry user to accommodate a wide variety of data economically and practically. (Author)

Aeronutronic, Newport Beach, Calif.
TELEMETRY SYSTEM STUDY. VOLUME II (of III). EXPERIMENTAL EVALUATION PROGRAM. Final rept. v. 2, 6 Feb 57-30 Nov 59, on Contract DA 36-039-sc-73182. 18 Dec 59, 135p. [7] refs. Publication no. U-743.
Order from LC mi$6.90, ph$21.30 PB 147 919-2

This volume presents the results of the tests which were performed on the four systems to determine the optimum values for system parameters. The tests included measurements of errors introduced by the system under the influence of external noise and interference simulating field conditions. (Author) (See also PB 147 919-1)

Aeronutronic, Newport Beach, Calif.
TELEMETRY SYSTEM STUDY. VOLUME III (of III). TELEMETRY SYSTEMS TEST EQUIPMENTS. Final rept. v. 3, 6 Feb 57-30 Nov 59, on Contract DA 36-039-sc-73182. 18 Dec 59, 125p. Publication no. U-743.
Order from LC mi$6.30, ph$19.80 PB 147 919-3

This volume describes the test equipment and operational procedures which were especially developed to permit accurate evaluation of telemetry system performance. (Author) (See also PB 147 919-2)

Airborne Instruments Lab., Inc., Mineola, N. Y.
FABRICATION OF ENGINEERING MODEL OF RADAR SET AN/FPN-31(XW-1) (AIRPORT SURFACE DETECTION EQUIPMENT), by Joseph E. Woodward and Bruce A. Woodward. Final engineering rept. on Contract AF 30(602)296. Mar 57, 46p. 6 refs. Rept. no. 2388-1; RADC TR-57-87; AD-114 474.
Order from LC mi$3.30, ph$7.80 PB 146 375

Design details, layout, fabrication, and testing of the FPN-31(XW-1) radar set were completed. The radar set comprises 3 major units: (1) a transmitter-receiver group containing the radar transmitter, receiver, and associated circuits; (2) an indicator group containing the PPI display and associated circuits; and (3) an antenna group containing a radar antenna, a radome, and associated components. System tests demonstrated that the model system meets specifications. The antenna has an azimuth beamwidth of 0.25° and a vertical coverage that extends to 25° below the peak with no holes. Circular polarization was very effective against rain return. A satisfactory air-inflated radome is available to cover the antenna. The transmitter and receiver demonstrated satisfactory performance, and the stable and effective AFC circuit is trouble-free. Operation of the indicator was satisfactory and provided a stable display with good resolution and azimuth repeatability. There are no components in the radar that are in critical supply. Magnetrons for use in the transmitter are available from at least 2 sources and provide satisfactory electrical performance; more data are needed on the life performance of magnetron types QK511 and 6551 when operated at the short-pulse duration. The radome was satisfactory in electrical and mechanical performance, but more experience is required to determine the expected service life.

Airborne Instruments Lab., Deer Park, N. Y.
INVESTIGATION OF MULTIFEED ANTENNAS AND WIDE-ANGLE OPTICS, by C. A. Bergren, L. J. Kuskowski, and W. D. White. Rept. on Contract AF 30(602)1980. Mar 60, 40p. 7 refs. Rept. no. 7358-I-4; RADC-TN-60-92.
Order from LC mi$3.00, ph$6.30 PB 147 836

The Cassegrain antenna system has yielded a partial solution to the problem of designing a wide-angle multifeed antenna. Although design data has been obtained for the Cassegrain antenna, the problem of reducing side lobes due to aperture blocking still remains. Several methods that utilize the blocking aperture to reduce side lobes have been investigated. The Schwarzschild antenna system--another two-

reflector system--is being investigated to determine its scan capabilities. The reflectors for this system are designed such that first order coma and spherical aberration are minimized over the necessary scan angles. Preliminary results have indicated that the Schwarzschild antenna system will yield scanning performance superior to that of the Cassegrain system. (Author)

American Inst. for Research, Pittsburgh, Pa.
PRINCIPLES AND PRELIMINARY RECOMMENDATIONS FOR A CORE SYSTEM OF NAVY RADAR OPERATOR TRAINING DEVICES, by Richard O. Peterson, Leon J. Lewandowski, and Angustus D. Daily. Rept. on Contract N61339-348. 2 Mar 60, 105p. 89 refs. Technical rept. NAVTRADEVCEN 348-1.
Order from LC mi$5.70, ph$16.80 PB 146 397

Investigation was made of the feasibility of developing a core of radar operator training devices of a general nature which could be used for training in a multiplicity of specific radar equipments and skills. Naval radar operator jobs were analyzed to determine the job contents which are common to many radar operator jobs. This resulted in a core of the skill and knowledge requirements which are basic to many radar operator jobs. From a rational analysis of the skill and knowledge requirements and of the equipment and training data collected, equipment design principles applicable to the design of radar operator training devices were derived. Preliminary recommendations for devices which would comprise a core training device system for radar operators were developed. (Author)

Armour Research Foundation, Chicago Ill.
PROCEEDINGS OF THE CONFERENCE [NO. 4] ON RADIO INTERFERENCE REDUCTION AND ELECTRONIC COMPATIBILITY HELD AT THE MUSEUM OF SCIENCE AND INDUSTRY, CHICAGO, ILLINOIS, OCTOBER 1-2, 1958. Oct 58, 664p. 133 refs.
Order from LC mi$11.10, ph$101.40 PB 148 073

Contents: The challenge of tomorrow's communications; an outlook into the future of the radio interference field and the part that the PGRFI will play in the future of the field of RF interference; radio gadgets; radio interference problems at AFMTC Cape Canaveral, Florida; comparison of PCM and PPM for radar command; the systems approach to missileborne telemetering interference; the measurement of interference effects on intelligibility; interference acceptance ratios in electronic communication equipments; computation of probability of interference due to adjacent channel cross-modulation, and intermodulation effects for randomly spaced equipments operating in the VHF and UHF bands; some observations concerning antenna and radiation patterns; target return losses due to blanking; variable gain interference reduction devices; external-transmitter interference in pulsed search systems; a formal representation of the interference between several pulse trains; design and development of a standard white noise generator and noise indicating instrument; receivers for interference measurements in the 20 to 4000 megacycle range; microwave field intensity meter; anechoic chambers for radio interference measurements above 50 megacycles; measurements of electromagnetic interference on high voltage (50 Kv) transmission lines; techniques for measuring three dimensional patterns; three dimensional radiation pattern graphical display technique; leakage of electromagnetic energy from coaxial cable structures; application of field theory to the solution of practical radiated radio interference problems; a free-space method for measuring coaxial cable shielding effectiveness; concepts of electromagnetic interference analysis and control; a method for controlling airplane wiring and equipment placement to eliminate AC magnetic field interference; spectrum signature; shortcomings of interference specifications; automatic power control; ferrites in radio interference filters; low pass filters using ferrites; radio interference control of semi-conductor circuitry; a non-linear effect in passive UHF transmission systems; analysis of interference generated in non-linear devices; a digital computer program for assigning a set of interference-free frequencies to a communications network; a digital computer technique for determination of permissible co-channel frequency assignment; application of digital computer model to the prediction of radio interference in a large signal complex; techniques for determining interference characteristics of communication equipment; processing of mutual interference charts for maximal lists of non-interfering frequencies. (See also PB 148 072)

Armour Research Foundation, Chicago, Ill.
PROCEEDINGS OF THE CONFERENCE [NO. 5] ON RADIO INTERFERENCE REDUCTION AND ELECTRONIC COMPATIBILITY HELD AT THE MUSEUM OF SCIENCE AND INDUSTRY, CHICAGO, ILLINOIS, OCTOBER 6-8, 1959. Oct 59, 697p. 118 refs.
Order from LC mi$11.10, ph$105.90 PB 148 074

Contents: Advanced technology and future problems in radio interference; spectrum utilization in a field army; the role of CISPR (International Special Committee on Radio Interference) in radio interference reduction and control; low noise devices as systems elements; susceptibility of pyrotechnic devices to electromagnetic energy; prediction factors influencing transmitter power spectrum; sensitivity of predicted interference to propagation model and spectrum availability; the construction of Mutual Interference Charts (MIC'S) and some statistical properties of the entries; processing of non-symmetrical mutual interference matrices; design of electromagnetic interference reduction; using computer simulation techniques; radio noise testing of the Lockheed Electra; interference implications of a commercial communications satellite system; measurements of spurious emission from an AM/EM tuner in accordance with Part 15 of the FCC Rules and Regulations; spurious responses of television receivers in the 300 to 1000 mc. region; investigation of corona noise in a three-phase transmission line; a thermistor bridge voltmeter for calibrating interference measuring instruments; application of the low noise traveling wave tube to interference instrumentation; a coaxial device for measuring the performance of shielding materials; a method of measuring high power transmitter cabinet and external wiring radiation; radio interference testing of large-scale computing systems-theory and practice; the effect of climatic environments on radio frequency interference; design of a wire communication system in a shielded passageway of the BMEWS radar system; planning interference-free communications-

electronics systems; procedure and problems inherent to interference testing of the B-58 aircraft; the systems approach in designing a specification for the control of radio interference in an airborne complex; some interesting aspects of interference and spurious signal measurements at the Army Transmitting Station Woodbridge, Virginia; radio interference detection system at Atlantic Missile Range (AMR); the gain of aperture antennas at spurious frequencies; Fresnel region patterns and gain corrections of large rectangular antennas; new techniques for evaluating the performance of shielded enclosures; contiguous wrapping of transmission line conductors with high-mu tape for large radio-interference attenuation; characteristics of microwave duplexer tubes under spurious radiation conditions; a method of evaluating the effectiveness of radio-frequency gasket materials; a transient suppressor for protection of transistorized equipment in 27 v D.C. aircraft electrical systems; relay noise suppression in airborne electronic systems; a method of assigning compatible frequencies to ground UHF radios in a transitional environment (Unclassified paper) (See also PB 148 073)

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
CAPACITY DIODE PARAMETRIC PERFORMANCE AND CIRCUIT DESIGN BY A FINITE CURRENTS METHOD, by Alan J. Fisher. 19 Jan 59, 34p. Rept. no. DG-TR-1-59; AD-216 182.
Order from LC mi$3.00, ph$6.30 PB 146 270

If a finite number of sinusoidal currents rather than voltages are permitted to exist in a capacity diode parametric device, the performance will be more efficient and more easily calculated. A two-current analysis of frequency doubling (and halving) is presented which shows the relationships between efficiency and power and diode cutoff frequency. Input and output coupling circuits which approximate the two-current analysis are shown. The analytic results are used to predict the generation of watts of efficient microwave power by all solid state devices. Finally, the extension of the finite currents method to higher harmonics and parametric mixers, amplifiers and oscillators is discussed. (Author)

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
AN/DRW-11 (XE-1) RECEIVER SPECTRUM UTILIZATION, by Merwin A. Olson and Charles E. Hyman. 15 Apr 60, 55p. AFC rept. #DC 15-4-60 RdeC.
Order from LC mi$3.60, ph$9.30 PB 147 521

Results are presented of a laboratory investigation of an AN/DRW-11 FM (406 - 450 MCS) receiver to determine its spectrum utilization and interference susceptibility characteristics; this information is necessary to allow for efficient frequency allocation. Operating characteristics such as frequency stability, sensitivity, selectivity, spurious responses, spurious emissions, audio characteristics, interference characteristics, and antenna input VSWR were tested. Frequency stability was found to be within 0.002% and the 3 db overall selectivity was 342 KCS. In the frequency range from 150 KCs to 10 KMCS there were eleven spurious responses less than 60 db down; of these responses only one was below 2500 MCS (410 MCS at 54 db down). Five radiated emissions were found to be in excess of MIL-I-26600 limits for Class I equipment. (Author)

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
ASCOP TK-M7 TELEMETRY TRANSMITTER SPECTRUM UTILIZATION, by Charles R. Wise and Merwin A. Olson. 15 Apr 60, 49p. AFC Rept. TM-15-4-60-T.
Order from LC mi$3.30, ph$7.80 PB 147 742

Frequency stability, power output, modulation sensitivity, and deviation were tested with respect to supply voltage, operating time and environmental conditions; interference characteristics (antenna conducted and radiated spurious emissions) were also examined; all tests were empirical in nature. All spurious emissions (antenna conducted), except one at 202 MCS (54 db down) and four harmonics of the fundamental, were within the requirements of WSMR Regulation Nr. 600-5-59. Frequency stability was within the required 0.01% except for: supply voltage reductions of more than 15%, prolonged exposure to high altitudes, and certain conditions of acceleration in excess of 15 G's. This transmitter is compatible with the 0.5 MCS channelization, as per WSMR Regulation 600-5-59. (Author)

[Army] Signal [Research and] Engineering Lab., Fort Monmouth, N. J.
APPLICATION OF AUDIO TRANSFORMER DESIGN METHOD OUTLINED IN FINAL REPORT IN CONTRACT NO. W36-039-sc-38268. "TRANSFORMER DESIGN CRITERIA AND DATA", by Irving Remis. 28 May 52, 22p. Technical memo. no. M-1429.
Order from LC mi$2.70, ph$4.80 PB 148 544

It is the purpose of this report to present a sample design complete with curves and other pertinent information to act as a guide for engineers with little experience in transformer design.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
COMPLEMENTARY TRANSISTOR MODULATOR, by J. Grau and B. Humbel. 1 Oct 59, 35p. 2 refs. USASRDL technical rept. 2068; AD-230 739.
Order from LC mi$3.00, ph$6.30 PB 148 115

A recent preliminary investigation of modulator circuits using two complementary transistors revealed that this type of modulator offers some unique features not found in other types of modulators. These are: (1) no dc supply voltage necessary as the carrier furnishes the supply voltage for operation, (2) carrier suppression, (3) elimination of the use of a balance transformer, (4) accomodation of dc input and output signals, (5) offers a power gain as high as 3 db, as compared to other modulations which usually have an insertion loss, and (6) compactness in size (only two transistors and one transformer necessary) These advantages open a broad field of applications, e.g. its use in carrier frequency equipment, single sideband equipment, etc. Modulator circuits using 2 complementary transistors are investigated; condi-

tions to be fulfilled for working configurations are established; test results of 2 modulator configurations are given; and the theory of operation is explained. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
AN EXPERIMENTAL PULSE REPEATER FOR TRANSMISSION OF INVERTED BINARY PULSE SIGNALS OVER FIELD WIRE, by H. Wolf. 1 Oct 59, 36p. 7 refs. USASRDL technical rept. 2082; AD-232 489.
Order from LC mi$3.00, ph$6.30 PB 148 117

The problems connected with the transmission of a one megabit binary pulse signal over field wire WD-1/TT are discussed. The inverted binary pulse signal is introduced and the design of a repeater for inverted binary pulses is described. The results of cascading a series of these repeaters are shown. It is concluded that the lack of an inexpensive and reliable retiming circuit is a problem which requires further study. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
MINIMIZATION OF CONNECTION ERRORS IN CRYSTAL IMPEDANCE METER LOAD CAPACITOR CALIBRATION, by Charles L. Shibla. 23 Mar 59, 38p. 2 refs. USASRDL Technical rept. 2017; AD-216 502.
Order from LC mi$3.00, ph$6.30 PB 146 266

Means of connecting crystal impedance meter load capacitors to capacity measuring equipment have been investigated. Stray capacities contributing to connection errors are identified and means of mutual cancellation are discussed. Construction details for connection devices and instructions for use are included. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PREFERRED RADIO FREQUENCY CABLES AND CONNECTORS FOR MILITARY APPLICATIONS, by Morton Pomerantz. 6 Jan 60, 11p. 3 refs. USASRDL technical rept. 2091; AD-231 568.
Order from LC mi$2.40, ph$3.30 PB 148 118

Tables are presented containing the latest applications and procurement information of radio frequency cables and connectors. A cross index between the 52 ohm and 50 ohm RF cables with their new nomenclatures are also given. The tables also include the latest connectors which were modified to make them compatible with the 50 ohm cables. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PROCEEDINGS OF THE SYMPOSIUM ON SOLID STATE MASERS, 12-13 JUNE 1958, HELD AT FORT MONMOUTH, NEW JERSEY. [1958] 105p. 28 refs. AD-217 741.
Order from LC mi$5.70, ph$16.80 PB 147 977

Contents:
Spin-spin interactions in potassium cobalti-chromicyanide
Some performance characteristics of solid-state masers
Relaxation measurements of Cr^{3+} in Al_2O_3
Recent developments in solid-state masers at Lincoln Laboratory
Some aspects of traveling-wave masers
Spontaneous emission into a single mode
Raman-type masers
Design of a maser amplifier for radioastronomy at 3 centimeters wavelength
Possible maser application of titanate host crystals
Proposal for a maser-amplifier system without non-reciprocal elements
Amplification and oscillation in two-level spin systems
Variation of crystal-field splitting by host-ion substitution in nickel double nitrates
Experiments with pulsed two- and three-level solid-state masers
Development of ruby maser at Willow Run Laboratories and future program
The necessary requirements for low-noise devices in radar and radiometry
Application of solid-state maser to fire control radar

Army Signal Research and Development Lab., Fort Monmouth, N. J.
SOLID TANTALUM CAPACITORS, by Albert Lunchick. 1 Oct 59, 17p. USASRDL technical rept. 2073.
Order from OTS $0.50 PB 161 821

The capabilities and limitations of the solid tantalum capacitor with respect to operating temperatures, electrical leakage, dissipation factor, stability, and life are summarized and illustrated. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE USE OF NETWORK TOPOLOGY WITH ACTIVE CIRCUITS, by Keats A. Pullen, Jr. Feb 60, 97p. 54 refs. Rept. no. 1096.
Order from LC mi$5.40, ph$15.30 PB 147 649

The application of the theory of linear graphs, or topology, to passive and active networks is reviewed, and some simplifications to the determination of equations for current and voltage gain are discussed. The calculation of the minimum number of network trees required to represent active networks is considered, and methods of simplifying the establishment of the required trees is examined. In addition, the active equations for the parametric amplifier are derived topologically. (Author)

Bulova Research and Development Labs., Inc., Woodside, N. Y.
AUTOMATIC MACHINE FOR SEALING OF QUARTZ CRYSTAL UNITS, by Robert J. Bibbero and R. Giglio Tos. Quarterly progress rept. no. 2, 25 Sep-24 Dec 57, on Contract DA 36-039-sc-72775. [1957] 25p.
Order from LC mi$2.70, ph$4.80 PB 137 443

An experimental run of HC-6/U cans and bases designed for projection weld sealing was ordered for evaluation in conjunction with commercial welding machines. Studies of machine layout and human task factors, together with automatic welding transport mechanisms, have been made which favor a rotary table mechanism. Vacuum pump-down calculations have been made and have led to a minimum pump size, for adequate chamber capacity, of 15 cfm with 0.1 micron ultimate vacuum. Present system capacity is estimated as 215 units per hour. (Author) (See also PB 137 444)

California U., Los Angeles.
ON THE PHILOSOPHY OF ADAPTIVE CONTROL FOR PROCESS ADAPTIVE SYSTEMS, by M. Margolis and C. T. Leondes. Rept. on Contract AF 49(638)438. Jan 60, 18p. 6 refs. AFOSR TN-59-1199; AD-233 499.
Order from LC mi$2.40, ph$3.30 PB 146 376

A very general approach is described to the design of process adaptive systems. A brief look is taken at the development of feedback control theory and practice. Then process adaptive control is discussed as a logical extension of the basic concepts of feedback theory. A particular mechanism for process adaptive control is suggested. This mechanism makes use of a learning model whose form is the same as the physical process and whose parameters are continually adjusted so that the model and process behave as much alike as possible. The parameters of the model are used to set the parameters of the controller for the overall control of the system. (Author) (See also PB 144 769)

Clevite Transistor Products, Waltham, Mass.
RESEARCH AND DEVELOPMENT OF GERMANIUM PNP JUNCTION SWITCHING TRANSISTORS, by Paul L. Meretsky. Progress rept. no. 5 (final), 10 May 58-9 Aug 59, on Contract DA 36-039-sc-75060. [1959] 74p. AD-232 673.
Order from LC mi$4.50, ph$12.30 PB 147 973

The following conclusions may be drawn from work accomplished: While the original specification was met on a developmental basis, some relaxations (saturation and thermal resistance) are required in order to make the device on a production basis. The thermal resistance will be somewhat compensated by a reduced low voltage Ico. At the same time certain specifications are tightened as in the case of fall time and current gain. A new suggested specification has been recommended. Additional specifications on breakdown measurements have been arrived at in the light of knowledge gained in the fifth quarter in which catastrophic failures in switching were assigned to device geometry as well as fabrication. A new packaging process was evolved during the Contract which has the capability of making hermetically sealed devices. Groups leak tested by the radioactive gas analysis method have an 81.8% expectancy to a leak rate of less than 7×10^{-12} cc/sec, and a 100% expectancy to less than 2.7×10^{-12} cc/sec. The devices were acceptable with respect to the environmental conditions set forth in MIL-STD-202 Method 106. Methods of introducing aluminum into the emitter have been reported and are thoroughly understood. (Author) (See also PB 146 167)

Colorado U., Boulder.
TRANSISTOR PHASE DETECTOR FOR PHASE-LOCK STABILIZATION OF A 30,00Mc/sec KLYSTRON, by Robert W. Zimmerer. Rept. on Contract Nonr-1147(05). [1959] 4p. AD-219 926.
Order from LC mi$1.80, 1h$1.80 PB 148 140

A novel high frequency phase detector was developed to operate over an input range of 12 to 18 mcs. A pair of Philco 2N588 transistors and a hearing aid battery were used to form the error signal which was applied to the repeller to an E. M. I. R. 9518 reflex klystron. The phase detector floats at -2000 volts and is connected to the reference signals through high frequency broad band ferrite transformers. (Author)

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
INVESTIGATION OF NOISE GENERATION IN ELECTRICALLY TUNABLE MICROWAVE OSCILLATORS, by G. C. Dalman, P. R. McIsaac, and L. A. MacKenzie. Quarterly progress rept. no. 1, 23 June-23 Sep 59, on Contract DA 36-039-sc-84524. [1959] 40p. 7 refs. Research rept. EE 449; AD-229 345.
Order from LC mi$3.00, ph$6.30 PB 147 966

Research is concerned with gaining an understanding of the mechanism of the noise and spurious-output-signal generation in electrically tunable oscillators and with determining possible methods of improving the performance of these devices as local oscillators. A general expression for the signal-to-noise ratio of a backward-wave oscillator, operating as a local oscillator, is derived using linear travelling-wave tube theory. An approach to the large-signal theory of backward-wave oscillator operation is formulated. Methods of determining experimentally the large-signal properties of oscillators are being investigated. Some experimental results have been obtained and are being correlated with the theoretically expected results. (Author)

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
INVESTIGATION OF NOISE GENERATION IN ELECTRICALLY TUNABLE MICROWAVE OSCILLATORS. Quarterly progress rept. no. 2, 23 Sep-23 Dec 59, on Contract DA 36-039-sc-84524. [1959] 52p. Research rept. EE-459; AD 234 840.
Order from LC mi$3.60, ph$9.30 PB 147 967

Measurements of the noise spectrum of a typical x-band backward-wave oscillator have been made and calculations of the signal-to-noise ratio begun. The normal mode analysis of transmission systems with current excitation is extended to cover the nonuniform current excitation of periodic circuits. The results are expressed in a form suitable for use with a nonlinear analysis of BWO's. A technique has been devised for determining experimentally the nonlinear characteristic associated with a self-excited oscillator. The method is essentially one of perturbation, which requires that small perturbing quantities be measured. To do this, a scheme for providing small changes in attenuation accurately has been developed. The general theory of perturbation is briefly outlined, and a specific case has been used for experimental

verification. The experimental data checks very well with theoretical predictions. (Author) (See also PB 147 966)

David Taylor Model Basin, Washington, D. C.
STRAIN-GAGE WATERPROOFING AND INSTRUMENTATION FOR FULL-SCALE SONAR DOME TESTS, by Mills Dean, III. Jan 59, 31p. 10 refs. Rept. 993.
Order from LC mi$3.00, ph$6.30 PB 138 273

Techniques used to install and waterproof a total of 168 strain gages are described. Also described is a unique method devised to accomodate the mass of connecting gage wires and to maintain the dummy gages in the same underwater environment as that of the active gages. Instrumentation circuits are given which were used for simultaneous recording of 61 channels of dynamic strain information on one sonar dome and 48 channels on the other.

Diamond Ordnance Fuze Labs., Washington, D. C.
FOUR-QUADRANT ANALOG VOLTAGE MULTIPLIER, by C. F. Ravilious. 16 May 60, 14p. 5 refs. TR-838.
Order from LC mi$2.40, ph$3.30 PB 146 812

A simple four-quadrant analog voltage multiplier is described. Four-quadrant multiplication is attained by means of a control winding, driven by one of the voltages to be multiplied, on the saturable reactor of a transistor-magnetic square-wave oscillator. The duty cycle of the oscillator is controlled by this input. A pair of transistor switches, operated from output windings on the oscillator core, apply the second voltage alternately in push-pull to two matched output resistors. The smoothed output taken across the two resistors in series is proportional to the product of the two input voltages. The operating range of the multiplier is $\pm$ 15 v output with a control winding input of $\pm$ 50 v and $\pm$ 25 v at the other input. Accuracy is within $\pm$ 2 percent of full scale. Power requirements are 12 ma at 12 v. (Author)

Electron Tube Research Lab., U. of Minnesota, Minneapolis.
STUDIES ON BASE NICKELS FOR OXIDE-COATED CATHODES, by W. G. Shepherd. Scientific rept. no. 7, 15 Oct 59-15 Jan 60, on Contract AF 19(604)3890. [1960] 82p. 3 refs. AFCRC-TN-60-194.
Order from LC mi$4.80, ph$13.80 PB 147 906

Problems associated with the preparation of Sr^{89}-tagged $(BaSr)CO_3$, prepared from $Sr(NO_3)_2$ powder irradiated in a high flux pile, are discussed. A technique is described for studying the long-pulse performance of oxide cathodes. Studies are reported of attempts to produce chemical activation by a controlled Ba atmosphere, in contrast to the normal chemical activation, in which an independent control of the alkaline earth metal vapor is not readily provided. Results are reported of the activation of oxide cathodes in the presence of active metal anodes. An experimental study of the deactivation of oxide cathodes by anode bombardment, and of subsequent reactivations is reported. Since all oxide cathodes are studied starting with a standard processing schedule, the effects of the processing schedule itself are reported. A technique for obtaining emission microscope patterns of an oxide cathode is described.

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
APPLICATION OF SILICON CONTROLLED RECTIFIERS TO A D-C SERVOMOTOR, by Clarence Cantor. Rept. on Contract Nonr-1841(53). Aug 59, 60p. 10 refs. Rept. 8060-R-1; AD-232 187.
Order from LC mi$3.60, ph$9.30 PB 147 686

Results are reported of designing, building, and testing a servo system which incorporates silicon controlled rectifiers as the power supply for a d-c servomotor. A half-wave, bi-directional circuit, supplied by single phase, 400 c, is selected as the basic circuit for the rectifiers and dc motor. Firing angle control of the silicon controlled rectifiers is accomplished by a simple, fast response, pulse firing scheme utilizing uni junction transistors. The input control signals are a 400 c positional error signal from a control transformer and a dc stablizing signal consisting of velocity feedback through a high pass filter. The locked rotor torque characteristics of the rectifier circuit, for both carrier modulated and dc control, are derived with the zero-signal firing angle as a parameter. Measured speed torque characteristics show essentially identical, linear characteristics for both types of control signals at low speeds and small values of signal. The rectifier circuit frequency response is measured and calculated. Both agree fairly well and indicate very little rectifier circuit phase lag at servo frequencies up to 50 cps. All of this represents a very fast, well damped, accurate servo system. (Author)

[Electronic Systems Lab.] Mass. Inst. of Tech., Cambridge.
HIGH-POWER PULSE GENERATION USING SEMICONDUCTORS AND MAGNETIC CORES, by Edward M. Lassiter. Rept. on Contract AF 33(616)5489. Jan 59, 42p. 11 refs. Technical memo. 7848-TM-2; AD-213 521.
Order from LC mi$3.30, ph$7.80 PB 148 040

A magnetic pulse generator using a controlled rectifier in the charging circuit is capable of generating high-power pulses and is suitable as a radar modulator. In the discharge network the saturable inductors operators operate as high-power switching devices and together with the capacitors reduce the duration of the current pulse from a long duration at the charging circuit to a short duration at the output. An experimental circuit demonstrates the theory. This circuit operates at a repetion rate of 5 kc and produces an average power output of 300 watts. The peak power and pulse width at the output are approximately 40 kw and 1.5 μsec respectively. The efficiency of the experimental circuit, not considering the bias circuit, is approximately 70 percent. (Author)

[Electronic Systems Lab.] Mass. Inst. of Tech., Cambridge.
A TRANSISTOR-MAGNETIC PULSE GENERATOR FOR RADAR-MODULATOR APPLICATIONS, by Arthur Krinitz. Rept. on Contract AF 33(616)5489. Sep 58, 97p. 7 refs. Rept. 7848-R-1; AD-210 247.
Order from LC mi$5.40, ph$15.30 PB 148 041

An experimental model of the pulse generator is described containing three Type H-2 transistors and one Type H-10, a two-section discharge network and a two-section pulse-forming network. The generator supplies a peak power of 24 kw to a Type 2J42 magnetron at a repetition frequency of 1.7 kc. The pulse duration is 1 μs and the average power delivered is 40 w. A jitter of less than 0.1 μs is achieved through the use of a low-ripple d-c power supply. An efficiency of 50% is achieved and it is believed that a considerable improvement in efficiency could be had by relatively simple modification of the circuit. It type to provide many times the power output of the experimental generator. (Author)

Electronics Research Labs., Columbia U., New York.
RESEARCH ON ULTRASONIC DELAY LINES, by W. Konig. Technical rept. T-1/152 for 1 Oct 58-30 June 59 on Contract AF 30(602)1971. 1 July 59, 91p. 22 refs. CU-2-59-AF-1971-ERL; RADC-TN-59-226; AD-219 634.
Order from LC mi$5.40, ph$15.30 PB 147 029

The general theory of elastic wave propagation is briefly presented. Reflection and refraction of plane elastic waves at plane interfaces are studied with special emphasis on the solid-air interface. Solutions to the wave equation for solid plates are presented and the specific solutions of interest in the design of delay lines are studied in detail. Design information is obtained for the vertical dimension of transducers to minimize the excitation of spurious modes in plates, thus reducing ripples in the passband of a delay line. Expressions permitting the calculation of delay variation with frequency are included and plotted for typical delay line parameters. Various kinds of quartz transducers are discussed. An equivalent circuit for a thickness vibrating piezo-electric transducer is presented and the implications of the circuit investigated. Expressions are obtained for midband loss and frequency response. The possibility of double-peaking in the frequency response is discussed, and the condition necessary for its occurrence determined. This includes results for typical delay line parameters. Various techniques of bonding are discussed and the results of one technique are compared to the performance predicted by theory. (Author)

Electronics Research Lab., U. of California, Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS.
Quarterly status rept. no. 4, 15 Oct 58-14 Jan 59, on Contract DA 36-039-sc-74981. [1959] 58p. 16 refs. AD-220 572.
Order from LC mi$3.60, ph$9.30 PB 148 106

Forward-wave amplifier: Investigations are presented concerning the possibility of noise growth in the gun region. Backward-wave amplifier: Investigation of the large-signal behavior of a beam type cascade backward-wave magnetron amplifier indicated that the beam position becomes a less critical factor in the RF performance as saturation is approached. It was further observed that at large signals the output power for 2-circuit operation reaches a maximum at a higher value of magnetic field than for small signals. Comparison of experiment and theory: Quantitative agreement between experiment and Sedin's large signal analysis for crossed-field devices was obtained for several aspects of backward-wave magnetron interaction. The large signal theory of Feinstein and Kino qualitatively agrees with observed experimental behavior for the power output-power input characteristic of the tube. New crossed-field tube design: The design was completed of a new experimental single-circuit M-type tube. Tube gain was calculated using Sedin's theory.

Electronics Research Lab., U. of California, Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS, by T. Van Duzer, J. R. Whinnery, and J. R. Anderson. Quarterly status rept. no. 6 and 7, 15 Jan-14 July 59, on Contract DA 36-039-sc-74981. [1959] 62p. 18 refs. AD-230 792.
Order from LC mi$3.90, ph$10.80 PB 148 107

In noise studies, a retarding field diode has been designed for obtaining a measure of stream velocity distribution at several planes near the cathode. In large signal studies, the interdigital circuit velocity has been found and impedance is being obtained. Measurements were made on a single-anode model of the multianode velocity analyser designed for measurements on a crossed-field beam in the gun region. Preliminary analysis of the crossed-field potential minimum, shows that the critical parameters could be so modified by the magnetic field that instabilities would occur. A cathode which produces a transverse field across its surface to compensate the magnetic forces in the potential minimum has been conceived. In the large signal studies, the electron gun was found to produce a well-defined, smooth beam which could be focused to the collector with negligible beam spread for d-c operation. The dispersion curves for the first spatial harmonic of the inter-digital circuit have been checked under hot test conditions and the results agree well with previous cold test measurements. Both forward- and backward-wave interaction over a wide frequency band has been obtained. Exploratory measurements show a power gain of at least 17 db for backward-wave amplification at small signals. (Author)
(See also PB 148 106)

Electronics Research Lab., U. of California, Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS, by J. R. Whinnery, C. K. Birdsall and others. Quarterly status rept. no. 8, 15 July-14 Oct 59, on Contract DA 36-039-sc-74981. [1959] 34p. 3 refs. AD-233 691.
Order from LC mi$3.00, ph$6.30 PB 148 108

A cathode which produces a transverse electric field across the surface in order to compensate the transverse magnetic forces in the region of the potential

minimum has been tested. The purpose of compensating the magnetic forces was to make the crossed-field potential minimum more like the ordinary type. The noise figure of the tube, operating as a N-type backward-wave amplifier, has been measured and is found to be of the same magnitude as for O-type traveling-wave tubes when attention was first directed toward their noise problem (25-35db). Also, signal-to-noise ratios were found to be very good (40 - 65 db). A range of d-c operating conditions has been determined over which a thin, rectilinear electron stream can be maintained. Some large-signal backward-wave amplifier experimental data have been obtained and are compared with Sedin's theory. Electronic efficiencies of 30% have been observed for backward-wave amplification, with the efficiency of conversion of available d-c beam energy to r-f wave energy as high as 70%. (Author) (See also PB 148 107)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
METHOD OF TESTING THE DIELECTRIC BREAKDOWN VOLTAGE AND DIELECTRIC STRENGTH OF MINIATURE SPECIMENS, by Andrew R. Blanck and Benjamin T. Holman. May 60, 10p. 4 refs. Technical notes no. 44.
Order from LC mi$1.80, ph$1.80 PB 145 926

Tubular shrouds were investigated as a means of preventing surface flashover in the testing of miniature test specimens for dielectric strength. The specimens used were cut from small-diameter polytetrafluoroethylene (TFE) rod. The technique is applicable whenever small specimens must be tested for breakdown voltage or dielectric strength and where flashover is found to occur. Tubular shrouds do not cause electric field distortion such as generally occurs with well-type specimens. (Author)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
HIGH-TEMPERATURE INSULATION FOR WIRE, by J. N. Harris and J. D. Walton, Jr. Rept. for Mar 59-Mar 60 on Electrical and Electronic Materials, Contract AF 33(616)3944. Mar 60, 40p. 2 refs. WADC Technical rept. 58-13, Pt. III.
Order from OTS $1.00 PB 161 788

Normal anodizing of commercial aluminum-clad copper wire did not result in complete anodization of the aluminum due to its thickness. Advantage was taken of the solvent action of sulfuric acid to remove a portion of the excess aluminum, however, complete anodization was not possible due to uneven removal of the aluminum causing exposure of the copper. Best results obtained were an anodized coating thickness of 0.8 to 1.0 mils and an unanodized aluminum layer 0.3 mil in thickness. The use of electrophoretic deposition of colloidal silica for sealing the pores of anodized coatings was not successful. Better results were obtained by providing colloidal silica sealing by gelling hydrolyzed ethyl silicate solutions on phosphoric acid anodized wire. This resulted in a wire insulation with an average dielectric constant of 2.89 and a dissipation factor of 1.87 per cent. The best insulation system was provided by sealing sulfuric acid--magnesium chloride anodized wire with a frit-resin coating. This wire was capable of operating at 800°F. (Author)

Hazeltine Electronics Corp., Little Neck, N. Y.
RADAR SET AN/TPS-25(XE-2) by R. A. Best and J. G. Simes. Final rept. for June 57-May 59 on Contract DA 36-039-sc-66411. [1959] 134p. Rept. 5115, includes rept. 9968-2; AD-228 080.
Order from LC mi$6.90, ph$21.30 PB 147 921

The Radar Set AN/TPS-25(XE-2) is a lightweight, highly-transportable battlefield-surveillance radar capable of detecting and locating a moving target or targets in the presence of ground clutter. The AN/TPS-25(XE-2), based on the non-coherent pulse doppler principle, can be used either inside or outside of its shelter. It is designed to search a given area for moving targets, and to aurally detect and locate them, especially at night or during periods of poor visibility. Equipment of this type is used for battle area surveillance by the latest Army ground service units; its accuracy and presentation are especially useful for artillery fire control. The acceptance tests were performed on two radar sets. They included all those environmental tests listed in the equipment specification. Changes determined by preliminary results of these tests were incorporated in all equipments and final test results indicated that the equipment met all of the acceptance test requirements. Additional tests, requested by the government representative were also described.

Hogan Labs., Inc., New York.
RESEARCH AND DEVELOPMENT OF AN OPTICAL TO ELECTRICAL SCANNING TRANSDUCER. Final technical rept. for 1 May 58-30 Apr 59 on Contract DA 44-009-eng-3485. 1 May 59, 79p. Rept. no. 1251-4; AD-218 992.
Order from LC mi$4.50, ph$12.30 PB 147 461

This report describes a high speed electro-mechanical scanning device to replace the manual tracing table in a Kelsh stereoplotter. The unit is capable of scanning the stereo model projected and formed by a Kelsh stereoplotter and will be suitable for use with automatic stereo mapping equipment.

Hughes Aircraft Labs., Culver City, Calif.
STUDY OF ATOMIC AND MOLECULAR RESONANCES FOR MICROWAVE GENERATION AND AMPLIFICATION, by G. Birnbaum, D. Devor and others. Final rept. for 15 Dec 57-15 Sep 59 on Contract DA 36-039-sc-74967. [1959] 57p. 29 refs.
Order from LC mi$3.60, ph$9.30 PB 147 426

The experimental performance of a ruby maser operating from 4° to 195°K is presented and discussed analytically. A 4-pound, liquid-nitrogen-cooled ruby maser amplifier was constructed with a 14-Mc gain-bandwidth product. The ordered operator theory of linear dissipative quantum circuits is extended to treat multi-port elements. Spin-lattice relaxation models are discussed. The feasibility of chemically tuning maser materials is demonstrated. Paramagnetic chars are assessed. The level splittings and transition probabilities for the ground state of rutile are given for various fields and orientations. (Author) (See also PB 147 425)

Hunt Corp., Carlisle, Pa.
DESIGN AND DEVELOPMENT OF IMPROVED METHODS OF MOUNTING AND ATTACHING SUPPORT WIRES TO LOW FREQUENCY RESONATORS, by R. E. Calaman. Final rept., 1 June 56-15 Apr 59, on Contract DA 36-039-sc-72791. [1959] 22p. AD-233 824.
Order from LC mi$2.70, ph$4.80 PB 147 976

Design and development efforts are summarized for mounting and attaching support wires to LF (below 500 kc) resonators. Studies indicated that satisfactory materials are limited for use in fabricating HF face-shear crystals for high-temperature (200°C) application. Adhesives and cements were unsatisfactory because of their instability and high damping characteristics. Lead attachments of quartz or glass filaments failed because of unmatched coefficients of expansion of the quartz plate, the filament, and the bonding glass solder. Plastic filaments were unsatisfactory for the same reasons, and because of distortion of their physical dimensions under heat and stress. Attachment of lead wires by cement caused damping and most cements could not be made electrically conductive. Evaporated films on the cements also failed. The use of foundation holes in their quartz gave greater strength but did not overcome the difficulties. Hard solders were used with good results but were not acceptable to the government. Nonbonded mountings were mechanically unsound. Pressure weld of metal leads to fired spots on the crystal faces by the thermo-weld technique provided the best bonds. Round configurations of DT cuts showed lower resistance than square units of similar construction and frequency. (See also PB 142 646)

Johns Hopkins U., Baltimore, Md.
THE TRANSIENT BEHAVIOR OF NONLINEAR SYSTEMS, by Francis H. Clauser. Rept. on Contract AF 49(638)496. Apr 60, 57p. 1 ref. AFOSR-TN-60-397.
Order from LC mi$3.60, ph$9.30 PB 147 520

It is shown that the classical perturbation procedure for treating nonlinear systems leads to solutions expressed as Fourier-like series with slowly varying coefficients. These slowly varying coefficients contain the information about the long term behavior of the system. Inconsistently, the classical perturbation procedure expresses these coefficients as power series, a mode of expression which has notoriously poor long term validity. An operational procedure is presented for treating oscillations having slowly variable amplitudes and frequencies.

Linfield Research Inst., McMinnville, Oreg.
THE APPLICATION OF FIELD EMISSION TO MILLIMETER-WAVE OSCILLATORS AND AMPLIFIERS, by F. M. Charbonnier, E. G. Brock and others. Final rept. 15 June 56-15 Aug 58, on Contract DA 36-039-sc-72377. [1958] 103p. 16 refs. AD-218 113.
Order from LC mi$5.70, ph$16.80 PB 147 987

Some distinctive properties of the field cathode and their implications in microwave devices are briefly discussed in the Introduction. The theoretical and experimental work performed on two field emission devices, a monotron oscillator and a frequency multiplier, is reported. In the latter case the experimental data obtained were used for a quantitative comparison with the theory. A satisfactory agreement was found, which confirms the high harmonic content of the field emission beam under suitable conditions, and suggests further work towards the development of high peak power field emission mixers and harmonic generators. The work on cathode and gun development is reported. Miniaturized high transmission field emission guns were developed under the present contract, which may be used in microwave and electron optical devices. A brief discussion is given of the high vacuum system and the microwave equipment built for the present contract, including test bench components at 70 kmc. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
PIEZORESISTIVITY IN SEMICONDUCTORS FOR TRANSDUCER APPLICATIONS, by L. E. Hollander, Jr., G. L. Vick and others. Technical rept. 1 June 59, 35p. 17 refs. LMSD-49736; AD-217 163.
Order from LC mi$3.00, ph$6.30 PB 147 675

Piezoresistivity, the result of strain on resistivity, offers a tool for analyzing the conduction mechanism in semiconductors and also offers potential transducer applications. A discussion of this effect and an analysis of the fourth rank piezoresistive tensor for 2 crystal symmetries are presented. The magnitude of the effect in semiconductors is tabulated, including 2 materials, TiO_2 and PbTe, which the authors have determined to be of considerable interest. The design of devices based on piezoresistivity is discussed and illustrated by working models. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
PRELIMINARY THEORETICAL AND EXPERIMENTAL STUDIES OF MICROWAVE MASER AMPLIFIERS, by J. Rowley and W. Taylor. Technical memo. 10 May 59, 32p. 7 refs. LMSD-49712.
Order from LC mi$3.00, ph$6.30 B 147 674

This report describes the initial phase, summarizing the experimental and theoretical studies, of an investigation of microwave amplification using stimulated electromagnetic radiation (MASER) between atomic energy levels of a paramagnetic material. Fundamental considerations for cavity and traveling-wave Maser amplifiers are discussed. Experimental data are reported on the microwave circuitry designed for the system. These data show good agreement with the design data. The data for the meanderline show good agreement with the theoretical predictions. From the data obtained, it appears that the microwave elements will satisfy the requirements for a working Maser. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
STATISTICAL DESIGN AND EVALUATION OF DEMODULATION SYSTEMS FOR ANGLE MODULATED SINUSOIDS, by J. J. Spilker, Jr. Technical rept. Apr 59, 83p. 21 refs. LMSD-48496; AD-216 592.
Order from LC mi$4.80, ph$13.80 PB 147 673

The optimum realizable demodulation system is derived for angle modulated sinusoids in the presence of additive noise. Optimum here refers to that estimate which maximizes the a posteriori probability of the message, given that a set of data was received, this message is most likely to have been transmitted. The optimum demodulation system is shown to have the same nonlinearities as a phase lock loop, but it has special linear filtering. A statistical comparison of the optimum system with a demodulation system using a discriminator shows the optimum system to provide significant improvement in the threshold signal-to-noise ratio. Another important set of results obtained in this paper is the derivation of the optimum realizable demodulation systems for signals where a modulated or sampled form of the message is used to angle modulate the carrier. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
THEORY OF FERRITE-COUPLED TRANSMISSION LINE NETWORKS, by Philip S. Carter, Jr. Technical note. 27 Feb 59, 28p. 9 refs. LMSD-48479; AD-215 979.
Order from LC mi$2.70, ph$4.80 PB 147 672

An analysis is presented of ferrite-coupled TEM-mode transmission lines. Both the reciprocal and nonreciprocal transmission properties of a two-line or two-mode system have been analyzed for the case where the axis of d-c magnetization is along the direction of transmission. The analysis was applied to the case of a transmission system which consists of two conductors plus a shield and it has been shown that under certain conditions the current will be coupled back and forth between the two conductors in a nonreciprocal fashion, i.e., gyrator action will be obtained. Formulas were derived from which the coupling coefficients due to the ferrite can be calculated for the case where the ferrite rod is located in the plane of symmetry between the two conductors. Finally, a proposed arrangement of ferrite coupled lines to form a transmission-line circulator is considered and its properties, i.e., matching requirements and isolation, are analyzed. (Author)

Mallory, P. R., and Co., Inc., Indianapolis, Ind.
SERVICE TEST MODELS OF POWER SUPPLY PP-1835 ( )/GRC AC POWER SUPPLY FOR STANDARDIZED SERIES OF FM RADIO SETS, by B. L. Borman. Final rept. 15 Apr 58-20 July 59, on Contract DA 36-039-sc-66435. [1959] 60p. AD-232 344.
Order from LC mi$3.60, ph$9.30 PB 148 104

The feasibility of producing AC power supplies for units of the AN/GRC-3 through AN/GRC-8 as well as AN/GRC-9Y in a PP-327F/GRC-9Y case was demonstrated. The power supply can operate Set 1(RT-66, 67, or 68/GRC); Set 2 (RT-70/GRC); Audio Amplifier (AM-65/GRC), or the Auxiliary Receiver (R-108, 109, or 110/GRC) singly or in possible unit combinations. Operation of the power supply without load is not detrimental. The operation of one or several units from a single supply required considerable voltage regulation to compensate for varying voltage drops resulting from variation in output currents. This is considerably different from previous supplies like the PP-327A which operated only into constant loads. By utilizing the latest power rectification and voltage control methods, a considerable reduction in internal dissipation of the supply was achieved. The silicon rectifiers and magnetic amplifiers used in this supply are not subject to aging and will operate at a higher temperature compared to the selenium rectifiers and series pass regulator tubes used in previous power supplies of this type. The 5 service test models for this contract satisfactorily passed all tests. (Author)

Massachusetts Inst. of Tech., Cambridge.
TRANSISTORIZED TWO-SEGMENT COMMUTATOR FOR A DIRECT-CURRENT MACHINE, by D. M. P. Eisenlohr. Rept. on Contract AF 33(616)3984. Feb 60, 61p. 31 refs. WADC Technical rept. 59-683.
Order from OTS $1.75 PB 161 790

This report covers the development of a fully electronic two-segment commutator, which was then experimentally used to demonstrate generator and motor operation of a d-c machine with a single winding armature. A short review is given of the brushless machines already existing and their similarities to synchronous machines. Their limitations are pointed out and a type of static bilateral inverter (commutator) is suggested, which would avoid these limitations. The main part of the report describes the development of a two-segment commutator using transistors for the commutator switches as well as for the control circuitry. The complete circuit consists of a position signal generator, mounted on the shaft of the machine, where the Hall effect is used for obtaining a signal indicative of rotor position without the use of mechanical contacts. This signal is converted into pulses by transistorized Schmitt triggers. These trigger pulses drive transistor control flip-flops, whose function is to turn on and off the power transistors responsible for commutating the armature. This inverter was shown to operate analogously to a mechanical two-segment commutator and some tests of its operation are reported. (Author) (See also PB 161 721)

Melabs, Inc., Palo Alto, Calif.
RESEARCH AND DEVELOPMENT OF A SOLID STATE PARAMAGNETIC MASER, by Roy W. Roberts. Quarterly progress rept. no. 6 (Scientific rept. no. 6) 10 Sep-9 Dec 59, on Contract AF 19(604)4071. 9 Jan 60, 34p. 2 refs. AFCRC-TN-60-140; AD-233 578.
Order from LC mi$3.00, ph$6.30 PB 146 323

A theoretical analysis of the ungrounded comb structure was extended. Methods of controlling the slowing factor were investigated and it was determined that considerable control could be exercised by changing the placement of the ruby slab. A theoretical analysis of a cross-relaxation effect which is particularly helpful at these frequencies was carried out. This is a multiple transition type effect and as such is very sensitive to paramagnetic ion concentration. (Author)

Microwave Associates, Inc., Burlington, Mass.
ENGINEERING REFINEMENT PROGRAM FOR S BAND TR TUBE EST-25( ), by Emanuel L. Horn. Final rept. 21 Apr 58-30 Oct 59, on Contract DA 36-039-sc-75039. [1959] 98p. AD-233 745.
Order from LC mi$5.40, ph$15.30 PB 147 969

The technique for fabricating the encapsulated windows appears to be applicable for production since a rate of six units per hour can be obtained with one set of equipment. The preliminary environmental tests seem to indicate that the window is rugged and can withstand severe mechanical and temperature shock. Additional environmental tests on the encapsulated window also failed to produce window failure. The windows were subjected to a non-uniform temperature shock test which should simulate the effect of a gas discharge on the window properties. The use of the improved ignitor assembly in a TR tube should result in a stable ignitor performance. (Author)

Microwave Associates, Inc., Burlington, Mass.
HIGH POWER C-BAND BEACON MAGNETRON RESEARCH AND DEVELOPMENT PROGRAM, by W. V. Hattery. Quarterly progress rept. no. 1, 1 July-30 Sep 59, on Contract DA 36-039-sc-78934. [1959] 29p. AD-230 919.
Order from LC mi$2.70, ph$4.80 PB 147 985

Research concerns the development of an adjustable frequency high power C-band magnetron. The magnetron shall be tunable through the range 5625 to 5675 Mc/s with a peak power output of 40 Kw. It shall operate with a 10 Kv maximum anode pulse with a ten microsecond duration. The delivery of three final design tubes and associated manufacturing drawings is required as partial fulfillment of the contract. A statement of the technical requirements and a description of the electrical and mechanical designs employed to meet these requirements are given. A cross section view of the proposed magnetron and an outline drawing, showing the general configuration of the proposed MA220 magnetron, are presented. Results of preliminary tests are given. The more difficult of the anticipated problems and the plans for their solution are discussed.

Microwave Associates, Inc., Burlington, Mass.
HIGH POWER C-BAND BEACON MAGNETRON RESEARCH AND DEVELOPMENT PROGRAM, by D. Hobbs. Quarterly progress rept. no. 2, 1 Oct-31 Dec 59, on Contract DA 36-039-sc-78934. [1959] 33p.
Order from LC mi$3.00, ph$6.30 PB 147 986

Results of tests performed on various subassemblies of the tube are described and various measured parameters compared with calculated values. A discussion of the results obtained on the operation of the first two tubes is given. Further discussion is given on work done to solve cathode problems due to the long-pulse operation requirement. (Author) (See also PB 147 985)

Microwave Associates, Inc., Burlington, Mass.
HIGH REPETITION RATE BROADBAND DUPLEXER, by Emanuel L. Horn. Quarterly progress rept. no. 4, 15 May-15 Aug 59, on Contract DA 36-039-sc-78165. [1959] 38p.
Order from LC mi$3.00, ph$6.30 PB 147 982

Measurements of arc loss and recovery time as a function of argon gas pressure were continued using an encapsulated input window containing various densities of quartz wool. The data shows that at practical operating pressures with peak incident power of 6 kw and 16 μs pulse width, an encapsulated window with no quartz wool has a minimum recovery time of 40 μs and a corresponding arc loss of 3.3%. Windows with medium density and heavy density quartz wool have minimum recovery times of 20 μs and 8 μs respectively and corresponding arc losses of 3.7% and 5.5%. Experimental windows with dumbell shaped irises and argon gas fills yielded minimum recovery times of 65 μs and 80 μs with corresponding arc losses of 2.35% and 5.5%. The modulator for the X-700 klystron has been received and installed. (Author) (See also PB 146 494)

Microwave Engineering Labs., Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS, by Roy W. Roberts. Quarterly progress rept. no. 11, 1 Nov 59-31 Jan 60, on Contract DA 36-039-sc-73278. [1960] 48p. 6 refs.
Order from LC mi$3.30, ph$7.80 PB 147 994

An expression is developed showing the volume dependence of the generated second harmonic power. This expression has been verified qualitatively. In general, best conversion is obtained from large samples with a high moment and narrow linewidth. It is relatively independent of sample shape provided no dimension is longer than a free space wavelength. An analysis of dielectric rod resonances has been applied to low-field ferrite rod resonances in an attempt to gain more quantitative information regarding the ferrite amplifier signal modes. A study of the theory has led to the concept of a new type of ferromagnetic amplifier. Considerable success has been achieved in growing large single crystals. In one run a crystal weighing nine-grams and measuring 2.3 cm in length was obtained. (Author) (See also PB 146 491)

Microwave Lab., Stanford U., Calif.
BASIC MICROWAVE RESEARCH, by M. Chodorow. Scientific rept. no. 19, 1 Oct-31 Dec 59, on Contract AF 19(604)1930. Feb 60, 30p. M. L. rept. no. 694; AFCRC TN-60-180.
Order from LC mi$2.70, ph$4.80 PB 148 028

Microwave Tube Studies: Analysis of the behavior of velocity modulated electron beams in long gaps has been extended to the calculation of the beam loading admittance. A project has been initiated to obtain highly convergent space-charge limited guns for certain crossed-field devices. Plasma Physics Studies: Numerical solutions have been computed for the determinantal equation for the interaction of a modulated electron beam with a plasma medium in an infinite magnetic field. A re-examination of the theory of traveling-wave type parametric amplification in a plasma column has given insight on the marginal performance of the tubes used. Experiments attempting to excite low-velocity plasma sound waves are described. A new electrode configuration for imposing the rf field on the plasma confirmed earlier conclusions that the confinement phenomena is not a radiation pressure effect but more likely a sheath effect. A new project is concerned with analysis of

nonlinear effects by Hamiltonian methods and the investigation of a possible experiment to verify the concept of Landau damping. Further knowledge has been gained about the production of cesium plasmas. Ferrite Studies: The objective of a new project is to investigate nonlinear resonance phenomena in small ferrite ellipsoids. Theory is being compared with experiments on small ferrite samples to gain insight into the essential factors necessary for efficient frequency multiplication using ferrites. (See also PB 145 968)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
LINEAR PASSIVE NETWORKS INVESTIGATION, by D. C. Youla and H. J. Carlin. Final rept. on Contract AF 30(602)1709. 15 Dec 59, 12p. Final rept. R-793-59; PIB-721; RADC-TR-59-253; AD-233 009.
Order from LC mi$2.40, ph$3.30 PB 146 124

This report is a presentation of the research in network techniques for lumped, distributed, active, and time-varying systems that has been carried out under this contract. The report contains the results on the physical realizability and general representation of linear, passive n-ports. Methods suitable for the broadband equalization of distributed parameter one-ports and lumped two-ports have been developed. The conclusions drawn from a study of the analytic properties of distributed-lumped networks are reported. The results of a theoretical and experimental program concerned with networks containing parametric elements are included. In general this program has extended many of the concepts of low frequency network theory to the solution of theoretical and practical design problems at microwave frequencies. (Author)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
QUARTERLY PROGRESS REPORT 15 APRIL 1957 THROUGH 14 JULY 1957 TO JOINT SERVICES TECHNICAL ADVISORY COMMITTEE, by Ernst Weber. Rept. on Contract AF 18(600)1505. Sep 57, 106p. 48 refs. Rept. R-452.8-57.
Order from LC mi$5.70, ph$16.80 PB 137 569

The research effort at the Microwave Research Institute is motivated by a desire to fulfill an academic responsibility by providing a means for both faculty and graduate student body to participate in a significant and fundamental research program responsive to technological and national interests. Accordingly the program covers a broad spectrum ranging from basic theoretical programs in physics, mathematics, and engineering to experimental programs involving basic measurements and the development of devices and materials. Although the specific structure of this program is continually being refined, it appears desirable to summarize from time to time the individual programs of the various groups and sections that constitute the Microwave Research Institute.

Motorola, Inc., Riverside, Calif.
PERSONNEL NAVIGATION SYSTEM STUDY, by Hugh J. Galbraith and Leslie D. Snyder. Final rept. for 15 Apr 58-15 Apr 59 on Contract DA 36-039-sc-75037. May 59, 497p. 787 refs. Rept. no. RLF-3838-1; AD-227 998.
Order from LC mi$11.10, ph$75.60 PB 146 981

A detailed design proposal for a lightweight manpack personnel navigation equipment is presented. The Appendixes support the proposed equipment design and constitute a final report on all phases of the theoretical and experimental investigations of applicable motional sensors, directional references and navigation techniques. The equipment embodies an ultrasonic Doppler velocity sensor, a magnetic directional reference and an operational-digital navigation computer and indicator. The unique features of the proposed design include a novel frequency tracking scheme, an all-electronic method of reading out magnetic heading and pulse-train digital computing techniques. The feasibility of magnetic velocity determination and algebraic-inertial navigation techniques were also investigated. The experimental effort included the fabrication and testing of ultrasonic Doppler transducers, simulators, and associated circuitry, magnetic heading reference circuitry, and magnetic field measuring devices. The human factors aspect of a personnel navigator were investigated and an experiment was conducted to obtain measurements of linear and angular accelerations that may be expected of a man carrying the navigation equipment. (Author)

National Bureau of Standards, Boulder, Colo.
VARIABLE CAPACITOR CALIBRATION WITH AN INDUCTIVE VOLTAGE DIVIDER BRIDGE, by Thomas L. Zapf. May 60, 9p. 4 refs. Technical note no. 57.
Order from OTS $0.50 PB 161 558

The use of an inductive voltage divider bridge for the calibration of three-terminal and two-terminal variable air capacitors is discussed. (Author)

Naval Research Lab., Washington, D. C.
REDUCTION OF THE HYDROGEN OVERVOLTAGE OF NICKEL ELECTRODES WITH PALLADIUM, by J. C. White and S. Schuldiner. Final rept. 6 May 60, 8p. 2 refs. NRL rept. 5454.
Order from LC mi$1.80, ph$1.80 PB 144 637

The hydrogen overvoltage of nickel electrodes in 21% KOH solutions can be lowered by the addition of palladium to the electrodes. This can be done either by plating Pd black on the surface or by alloying nickel with a small amount of palladium. In the latter case it was shown that under anodic and cathodic cycling, palladium concentrated on the surface of the electrode. The possible use of these modified nickel electrodes in the electrolytic oxygen generator developed at NRL is suggested. (Author)

Office of Scientific Research and Development. Div. 6.
SEA-WATER BATTERIES, by W. H. Martin (Bell Telephone Labs., Inc.). Final rept. on Contract OEMsr-1069. 30 Nov 45, declassified 1 Feb 60. 535p. Section no. 6.1-sr-1069-2128; OSRD no. 6420; AD-128 639.
Order from LC mi$11.10, ph$81.90 PB 146 264

Part One outlines basic research and the general principles of electrochemical and mechanical design of sea-water batteries. Part Two describes specific designs of sea-water batteries, their performance

characteristics, and the testing program. Part Three covers battery building and related activities such as the development of tools, facilities and methods for battery production, materials procurement, and engineering of the transition to manufacture. Nine appendices are a selection of technical papers that deal with electrochemical and hydraulic considerations. Also included are a list of other pertinent memoranda and letters, and a bibliography of technical memoranda, specifications, and patent applications. The sea-water batteries developed under this project, employ silver chloride as the active cathode material and magnesium alloy as the anode. Sea water is admitted to the battery by breaking the seals at the time the battery is put in use.

Physical Science Lab., New Mexico State U., University Park.
400 Mc/Sec CUTOFF NOTCH ANTENNA AEROBEE HI, by Dennis G. Henry. Scientific rept. no. 4, on Contract AF 19(604)2188. 2 Mar 60, 21p. AFCRC-TN-60-295.
Order from LC mi$2.70, ph$4.80 PB 147 898

This report gives the characteristics of the 400 Mc range Command Control Notch Antenna for the AEROBEE HI. This antenna is to be modified from the 54.5 Mc notch antenna. A detailed study of the radiation pattern was conducted to see what effect the modification had. A bandwidth check was also made. The physical dimensions of the modified antenna are given and compared to the original 54.5 Mc notch. These changes are shown in the included photographs. (Author)

Physical Science Lab., New Mexico State U., University Park.
SPLIT MISSILE ANTENNA; 400 Mc COMMAND CONTROL NOTCH ANTENNA; THE THREE ELEMENT SLOT ARRAY AND BENT-DIPOLE NOSE PROBE; QUADRALOOP ANTENNA AT S-BAND; TELEMETRY AND COMMAND CONTROL ANTENNAS; RADIO FREQUENCY BREAKDOWN MEASUREMENTS ON QUADRALOOP ANTENNAS. Final rept. on Contract AF 19(604)2188. 28 Apr 60, 10p. 6 refs. AFCRC-TR[60]261.
Order from LC mi$1.80, ph$1.80 PB 147 899

Radio Corp. of America, Lancaster, Pa.
ELECTRON TUBE MATERIALS, GASES, AND GETTERS, by J. C. Turnbull and G. P. Kirkpatrick. Quarterly progress rept. no. 4, 15 July-15 Oct 59, on Contract DA 36-039-sc-78226. 15 Nov 59, 66p. 7 refs. AD-232 384.
Order from LC mi$3.90, ph$10.80 PB 147 991

Outgassing data were obtained on Ni, cold-rolled steel, Ni-plated steel, gas-carbonized Ni-coated steel, Al-clad steel, Mo, and Kovar by the use of RF induction heating (AD-227 616). The metal sample was a strip 0.005 in. thick, formed into a cylinder 1 in. in diameter by 3/8 in. high. The cylinder was mounted on a tungsten lead stem and had a chromel-alumel thermocouple welded to the inside. The sample was sealed inside a hard glass bulb, exhausted, and baked at 400°C for 1 hour. The gas evolution obtained on heating the sample by RF induction was measured with a mass spectrometer. Quantities of the gas components (H, CO + N, CO_2 and O) for Ni, Mo, Ni-plated steel, and Kovar were similar in magnitude. H ranged from 0.5 to 2 1-μ/g, CO + N from 10 to 30 1-μ/g, and CO_2 from 2 to 9 1-μ/g. Al-clad steel showed higher levels of H, with other gases in the same range. Cold-rolled steel showed similar levels of H and CO_2, with much higher levels of CO + N. Carbonized Ni-coated steel showed high levels of all gases, with a small evolution of O at the higher temperatures. Lower-temperature (400°C) outgassing experiments for 40 hr were performed on Ni, cold-rolled steel, Al-clad steel, gas-carbonized Ni-coated steel, Ta, Cu, and mica. Little relationship was found by comparing gases evolved on heating in 20-min steps to 1000°C with gases determined by vacuum fusion analysis. The predominant gas on outgassing at 400°C was H. (See also PB 145 802)

Ramo-Wooldridge, Div., Canoga Park, Calif.
STUDY OF FAULT LOCATION AND PREDICTION TECHNIQUES LEADING TO PLANS FOR AUTOMATIC AND DYNAMIC TESTING OF MILITARY GROUND EQUIPMENT, PARTS I AND II. Final rept. on Contract AF 30(602)1997. 15 Feb 60, 192p. 3 refs. C62-9U37; RADC-TR-59-248A. AD-233 011.
Order from LC mi$8.70, ph$30.30 PB 146 109

The study has been oriented to resolving the problems of automatic monitoring and testing of the equipments of a P-site; a primary objective has been to arrive at plans for a test-system which would be applicable not only to a P-site but to a variety of operational and maintenance installations, both present and prospective, the only important condition being that the equipments or systems to be tested are basically electrical or electronic in nature. Part I. Theory, Methods, and Design Principles. Part II. Test-System Plans.

RCA Defense Electronic Products, Camden, N. J.
MARKER BEACON RECEIVER R737( )/ARN, by F. E. Randolph. Final engineering rept. 15 July 56-31 Jan 57, on Contract DA 36-039-sc-73083. [1957] 90p. AD-221 459.
Order from LC mi$4.80, ph$13.80 PB 147 978

The design is presented of a completely transistorized 75mc fixed frequency marker beacon receiver of unusually small dimensions, light weight, low power drain and rugged construction for use in Army aircraft. The radio receiver R-737( )/ARN employs a double coversion superheterodyne circuit for the reception of aircraft beacon signals. The circuits are fully transistorized utilizing subminiature components mounted on a printed circuit board. (Author)

Rixon Electronics, Inc., Silver Spring, Md.
SYNTHESIS OF A TYPE OF PHASE CORRECTOR FOR MAGNETIC TAPE RECORDERS, by Richard A. Wainwright. Technical rept. no. 1 on Contract DA 49-186-502-ORD-832. Apr 60, 100p. 27 refs.
Order from LC mi$5.40, ph$15.30 PB 147 637

This paper covers several closely related areas concerning approximately linear phase, complex wave handling systems, with particular emphasis on phase linearization of magnetic tape recorders. The first

subject concerns the phase and amplitude requirements of a system required to handle complex waveforms in order to have an output waveform that for the most part resembles the signal applied to the input terminals. The second section covers complex waveform makeup, their Fourier expressions where convenient, spectrum plots of certain types of complex waveforms, and shows pictorially the effects of amplitude and phase distortions of a few common waveforms, viz., square waves, and triangular type waveforms. The third section covers the general theory of All-Pass Networks from the point of view of the poles and zeros of the transfer function, and includes a discussion of mismatch effects. Section four describes the system used to verify the phase correcting scheme described in section three. Section five gives a rather general coverage of tape noises and includes a curve which shows the approximate spectrum of tape noise vs. tape-to-head spacing. The conclusion lists several applications of the networks described that are not included in the main body of the report.

Rome Air Development Center, Griffiss AFB, N. Y.
DESIGN OF A RADAR COVERAGE INDICATOR FOR RADAR QUALITY-CONTROL FUNCTIONS, by Edward F. LaForge and Edmund J. Kennedy. Apr 60, 19p. RADC-TR-60-10.
Order from LC mi$2.40, ph$3.30 PB 147 770

A radar coverage indicator has been designed, and a model developed, to satisfy the requirements of the Air Defense Command and the Tactical Air Command for a suitable radar quality-control device. This report describes the model, and includes a brief description of the function of the radar coverage indicator, with emphasis on those aspects of the display considered significant from the operator's viewpoint. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
EVALUATION OF SAL-81 KLYSTRON, by Dirk T. Bussey. Apr 60, 24p. RADC-TR-60-39.
Order from LC mi$2.70, ph$4.80 PB 147 663

The SAL-81 is a three-cavity electrostatically focused amplifier klystron that was designed for pulsed operation in L-band at power levels up to 20 kilowatts peak. This report describes the measurements that were made and the tests performed to establish the operating parameters of this tube under conditions useful in pulse radar design. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
MULTIPLE ANGLE DIVERSITY DESIGN CONSIDERATIONS, by W. R. Richard and M. H. Bickelhaupt. Apr 60, 39p. 21 refs. RADC-TN-60-22.
Order from LC mi$3.00, ph$6.30 PB 147 753

Tropospheric scatter communication will become a very important means of communication in the foreseeable future. In order to obtain longer ranges, tropospheric scatter systems have been designed for use at lower and lower frequencies. At the present time our longest range tropospheric scatter equipments operate in the region of 400 megacycles; but there are regions in the world where this frequency band cannot be made available. Accordingly, a new principle, multiple-angle diversity, has been applied, which allows somewhat greater ranges or more reliability at higher frequencies - even into the microwave region. This paper discusses the multiple-angle diversity scatter system and its design considerations. Particular attention is given to the beam patterns employed and to accordant modifications of antenna and antenna-feeder requirements. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
THE NATURE AND BEHAVIOR OF REDUNDANCY NETWORKS AND FUNCTIONS, by Fred Moskowitz. May 60, 196p. 33 refs. RADC TR-60-4.
Order from LC mi$8.70, ph$30.30 PB 148 022

This report presents various properties and characteristics of probabilistic redundancy networks and functions which can be used to represent reliability relationships in complex equipment containing redundant elements; large scale systems containing a multiplicity of alternative subsystems or telecommunication nets containing possibilities of alternative routing. By making the simplifying assumptions that all elements of a system have independent failure statistics and that the reliability of an element remains unchanged when it is incorporated into a system, a simple algebra can be used by means of which the analysis of such redundancy networks becomes possible. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
RADAR DATA TRANSFER SYSTEM AN/TRQ-10(XW-1)/GR, by G. K. Bennison and M. M. McCormick. Apr 60, 116p. RADC TR-60-38.
Order from LC mi$6.00, ph$18.30 PB 147 760

This system operates in the 7135- to 7985-mc frequency range and relays radar search and surveillance data by a narrow microwave beam, virtually eliminating interception by an enemy. The equipment is compact, easily transported by land or air, and readily sited. It consists of a transmitting unit and a receiving unit which are rack-mounted in portable electrical equipment shelters. The system range (15 to 30 miles under line-of-sight conditions) can be extended by the use of repeater stations and is a great improvement over the 10,000-foot limitation of cable-link systems. Azimuth data, three video signals range marks and trigger pulses are combined and transmitted on four f-m microwave carriers. The system was field tested using an r-f path established between Griffiss AFB and Verona, N. Y. Receiver sensitivity, transmitter power output, cross-talk measurement, azimuth tracking accuracy, power regulation, comparison of local and remote plan position indicator (PPI) presentations, and antenna radiation pattern, system delay, and VSWR measurements were among the tests performed. This new microwave system constitutes an effective and very reliable link for transmitting tactical radar data to distant points. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
TROPOSPHERIC SCATTER RADIO SETS AN/FRC-39(V) AND AN/FRC-56(V), by Lewis A. Javarone. Dec 59, 25p. RADC TR-59-8; AD-232 052.
Order from LC mi$2.70, ph$4.80 PB 146 271

Radio sets AN/FRC-39(V) and AN/FRC-56(V), standard military sets developed for tropospheric scatter, are described. Test results are appended. (Author)

Sperry Gyroscope Co., Great Neck, N. Y.
DEVELOPMENT OF A LOW-FREQUENCY TRAVELING-WAVE-TUBE CHAIN. Final progress rept. 1 Dec 56-28 Feb 59, on Contract DA 36-039-sc-73116. Oct 59, 159p. 13 refs. Sperry rept. no. NA-8230-8157.
Order from LC mi$7.50, ph$24.30 PB 147 971

Ten STP-106 prototypes were constructed. A demountable tube was assembled, containing the helix interaction structure, to develop a satisfactory low-noise gun. The construction of this tube provided for the expeditious interchange of electron guns and adjustment of beam entrance point. An optimum configuration of mechanical and electrical parameters provided the required low-noise figure. The STP-107 traveling-wave tube is a modification of the STP-172. Particular attention was directed toward attenuator design and construction to reduce gain fine structure. In addition, construction techniques for the envelope, r-f connection, electron gun assembly, and helix support assembly were studied. These studies, which reduced leakage and mounting problems, yielded a rugged tube meeting specifications.

Sperry Gyroscope Co., Great Neck, N. Y.
INVESTIGATION OF MICROWAVE WINDOW FAILURE MECHANISMS AND THEIR ELIMINATION, by T. Sege, D. Churchill, and others. Quarterly progress rept. no. 1, 1 June-1 Sep 59, on Contract DA 36-039-sc-78314. Oct 59, 65p. 22 refs. Sperry Rept. no. NA-8240-8182-1; AD-232 923
Order from LC mi$3.90, ph$10.80 PB 147 972

A survey of industrial and academic organizations has shown that window failure is caused by arc-over, thermal breakdown, seal failure, and dielectric puncture and cracking. The mechanisms of radiation damage, intrinsic breakdown, and thermal breakdown apparently change the structure of window materials. Sample materials are undergoing analyses to correlate crystalline structure with failure mechanism. Arc-over in both transverse and slanted surfaces is being studied using field-strength techniques. High-order mode resonances and surface losses are being investigated. (Author)

Stanford Electronics Labs., Stanford U., Calif.
ASSOCIATION BETWEEN AURORAE AND VLF HISS OBSERVED AT BYRD STATION, ANTARCTICA, by L. H. Martin, R. A. Helliwell, and K. R. Marks. Technical rept. no. 1 on National Science Foundation Grant 9511. 29 Apr 60, 13p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 147 749

Observations through 1959 at Byrd Station, Antarctica (70.5°S Geomagnetic), show that a close association exists between aurorae and certain VLF hiss. The hiss usually occurs in a broad band with a center frequency of about 8 kc/s. The intensity and bandwidth vary with ionospheric absorption and may also vary with the intensity of the aurorae. Under conditions of extreme ionospheric absorption the intensity of the hiss drops to undetectable levels even in the presence of intense and active aurorae. There are some indications that the center frequency of this auroral hiss band may be related to the type of aurora; in particular, a center frequency of 9.6 kc/s appears to be associated with red aurora. The average field intensity of the auroral hiss lies between 1 mv/m and 3 mv/m.

Stanford Electronics Labs., Stanford U., Calif.
CAVITY AND TRAVELING-WAVE MASERS USING RUBY AT S-BAND, by W. S. C. Chang, J. Cromack, and A. E. Siegman. Rept. on Contract DA 36-039-sc-73178. 28 July 59, 25p. 6 refs. Technical rept. no. 155-2.
Order from LC mi$2.70, ph$4.80 PB 146 276

Several three-level solid-state masers using ruby have been operated at frequencies near 3000 Mc/s, using a high-efficiency cavity having TEM modes in a rectangular geometry, or a meander-line slow-traveling-wave circuit with low group velocity over the signal pass band. Various possible maser operating points in the energy-level spectrum of ruby have been studied with both structures. At good operating points, i.e. points where the observed inversion at the signal frequency is large when the pump is turned on, large gain-bandwidth products are obtained in the cavity maser and large gains/unit length in the traveling-wave maser. Although the cavity gain-bandwidth products obtained are two orders of magnitude larger than were obtained in early maser work, and are sufficiently large for some practical applications, the traveling-wave maser appears to have much more promise due to its inherently broader bandwidth, stability and built-in nonreciprocity. (Author)

Stanford Electronics Labs., Stanford U., Calif.
ELECTRON DEVICES RESEARCH. Consolidated quarterly status rept. no. 11, 1 July-30 Sep 59 on Contracts DA 36-039-sc-73178, AF 33(616)6207, AF 19(604)5480, Nonr-225(40) and Nonr-225(24). [1959] 70p. 5 refs. AD-229 956.
Order from LC mi$3.90, ph$10.80 PB 147 014

Stanford Electronics Labs., Stanford U., Calif.
TRAVELING-WAVE TECHNIQUES FOR MICROWAVE RESONANCE MEASUREMENTS, by A. E. Siegman. Rept. on Contract DA 36-039-sc-73178. 12 Oct 59, 11p. 5 refs. Technical rept. no. 155-3.
Order from LC mi$2.40, ph$3.30 PB 146 277

Recent developments in traveling-wave solid-state masers point up the utility of slow-wave circuits in comparison with cavities for magnetic resonance measurements. Among other advantages, slow-wave circuits are ideally suited for broadband or multifrequency measurements without loss of sensitivity; they readily produce circularly-polarized fields over large volumes; measurements of χ' and χ'', which involve measurements of resonant frequency and Q in a cavity, reduce to generally simpler measurements of attenuation and phase shift. Because slow-wave circuits are less widely known than cavities, this paper proposes to discuss some of their characteristics which are especially relevant to magnetic resonance measurements and to point out ways in which slow-wave circuits can be used to advantage. (Author)

Syracuse U. Research Inst., N. Y.
FERRITE POSTS IN RECTANGULAR WAVEGUIDE, by Harry Gruenberg and Arthur Cohen. Technical rept. on Contract AF 30(602)1627. 1 June 59, 51p. 17 refs. SURI rept. no. EE475-596-TR-1; RADC-TR-59-91; AD-217 679.
Order from LC mi$3.60, ph$9.30 PB 147 030

Measurements were made of the scattering matrix of a cylindrical ferrite post in a rectangular waveguide and the results are compared with an approximate theory. The theoretical formulas are used to compute the constants of the ferrite, such as dielectric constant, saturation magnetization, and loss factor, from the experimental results on thin posts. These computed values are then used to predict the scattering matrix for posts of larger diameters to see how far the theory can be extrapolated. (Author)

Technical Research Group, Syosset, N. Y.
YAGI ANTENNA STUDY, by Alan F. Kay. Scientific rept. no. 1 on Contract AF 19(604)3476. 6 Jan 60, 53p. 12 refs. TRG-121-SR-1; AFCRC-TN-60-364.
Order from LC mi$3.60, ph$9.30 PB 148 012

An experimental study of the near fields of yagis was undertaken. Quantities measured were the surface wave phase velocity, longitudinal and transverse field decay; excitation efficiency, tolerance effects, ohmic losses, and behavior near the source. Particular emphasis is given to long maximum gain yagis (up to 300λ in length) and how the above quantities enter to limit the gain. A partially empirical theory is developed from the extensive measured data which gives a simple picture of the fields around a yagi suitable for computing far field patterns without the errors of the Hansen-Woodyard theory. This theory would be applicable to other parasitic linear, endfire antennas. (Author)

Tung-Sol Electric, Inc., Bloomfield, N. J.
UTILIZATION OF SELF-SUSTAINED ELECTRON EMISSION INVESTIGATION, by B. G. Firth. Quarterly rept. no. 2, 1 Jan-31 Mar 59, on Contract DA 36-039-sc-78081. [1959] 23p. AD-217 861.
Order from LC mi$2.70, ph$4.80 PB 147 988

Five active phases of the project are discussed. (1) Completion of the magnetic analysis of electron energy distribution from the MgO self-sustained emission cathode shows a peak at 13.5 volts and 90% of electrons less than 65 volts. The curve is believed to give an energy distribution accurate to a few volts. (2) Preliminary cathode ray guns have been operated with beam currents of 0.3-0.5 ma with control grid at 300-400 volts and collector at 1500 volts. (3) Mesh dynodes for the secondary emission preamplifier have been made with an effective delta of 3. (4) A new Type DT-812C audio output amplifier tube is being designed to be more effective than the present DT-812B. It is hoped to exceed the 600 micromhos Gm of the latter. (5) Cathode research and development is in progress to (a) determine the illusive factors periodically affecting quality, (b) establish necessary controls for them, (c) improve the cathode, and (d) work out if possible an effective preprocessing method to do away with any necessity for admitting air on exhaust. The sodium activated cathode is found to start 3 to 6 times faster than the regular MgO cathode with a "daylight" lamp shining on it. (Author)

Westinghouse Electric Corp. [Lester, Pa.]
PHOTOEMITTER PREPARATION BY EMPIRICAL AND MICROBALANCE TECHNIQUES, by Eugene Heath. Rept. for 1 June 58-30 Nov 59 on Research on the Quantum Nature of Light, Contract AF 33(616)5729. Feb 60, 50p. 2 refs. WADD Technical rept. 60-5.
Order from OTS $1.25 PB 161 782

A design for a vacuum system to be used with a microbalance in the study of photosurfaces has been successfully evolved and tested. The chief problem of such a system appears to be the large volume. By reducing the volume to a minimum and by suitable baffling and restrictions, the effect of the large volume has been minimized. A photosurface of the antimony-cesium type has been successfully formed within this system. An empirical study of photosurfaces has led to a modified multi-alkali type photosurface with a maximum overall sensitivity of 140 microamperes per lumen, a peak response shifted to approximately 6000 Å and appreciable response beyond 8000 Å. A tentative processing schedule for forming this photosurface is given. (Author)

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 1, 1 Jan-31 Mar 56, on Contract DA 36-039-sc-71158. 30 Apr 56, 12p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 147 922

Apparatus to obtain antenna gain and pattern measurements is required for the study. The first period was devoted to the design and construction of the apparatus for making these measurements. Several surface wave antennas have also been constructed.

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 2, 1 Apr-30 June 56, on Contract DA 36-039-sc-71158. 31 July 56, 24p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 147 923

The construction of the apparatus necessary for taking horizontal radiation patterns of surface wave antennas has been completed. The turntable to support and rotate the antennas is driven from the receiver location by power synchros. Microwave absorber screens behind the antenna serve to minimize room reflections. Some preliminary pattern measurements have been made on two types of surface wave antennas. The two types of antennas are the surface wave cone antenna and the surface wave dipole antenna. The results obtained for these antennas, operating at the design frequency of 9360 mc/s, appear to show promise. (Author) (See also PB 147 922)

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 3, 1 July-30 Sep 56, on Contract DA 36-039-sc-71158. 31 Oct 56, 17p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 147 924

A number of improvements were made in the antenna measuring apparatus as well as in the antenna structure itself. These improvements resulted in more reliable antenna measurements. A suitable termination for the surface wave turnstile antenna has been found, thus removing the uncertainty of the presence of a reflected wave. The preliminary horizontal and vertical pattern measurements made thus far, along with approximate gain measurements indicate, that a fairly large number of elements must be used in the turnstile arrangement if reasonable values of gain are desired. An approximate gain of 9 db was obtained for 44 elements. The optimum design has not yet been determined but a method for measuring the phase velocity along the antenna structure has been found and should aid materially in obtaining design criteria. (Author) (See also PB 147 923)

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 4, 1 Oct-31 Dec 56, on Contract DA 36-039-sc-71158. 31 Jan 57, 17p. 8 refs.
AD-130 601.
Order from LC mi$2.40, ph$3.30 PB 147 925

Detailed measurements were made on a surface-wave turnstile antenna to obtain data for optimizing antenna design. These measurements are the reduction in phase velocity along the antenna structure versus both the length and the cross-sectional area of the elements, and the attenuation along the structure versus the number of elements. Results indicated that a reduction in phase velocity along the antenna structure of more than 3% is necessary for reasonable efficiency. This 3% reduction requires 44 elements (11 wavelengths) to achieve a 9-db gain; about 66% of the input power is lost in the termination. The larger the reduction in phase velocity along the antenna, the greater is the radiating efficiency. An increase in the reduction of phase velocity is possible by choosing the proper length and diameter of elements and by increasing the number of elements per wavelength. The analytical solution of the surface wave turnstile antenna shows promise. (See also PB 147 924)

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 5, 1 Jan-31 Mar 57, on Contract DA 36-039-sc-71158. 30 Apr 57, 25p. 8 refs.
Order from LC mi$2.70, ph$4.80 PB 147 926

Measurements are presented of the gain, beam width, reduction in phase velocity, pattern, and attenuation of a turnstile type of surface wave antenna. It appears that sufficient data on this antenna has now been obtained to make possible an optimum design. (Author) (See also PB 147 925)

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 6, 1 Apr-30 June 57, on Contract DA 36-039-sc-71158. 31 July 57, 70p. 20 refs.
AD-139 776.
Order from LC mi$3.90, ph$10.80 PB 147 927

An analysis was made of the surface wave turnstile antenna. The analysis does not permit a complete antenna design since the attenuation of the wave along the structure cannot be predicted with reasonable accuracy. The calculations are based on the assumption that a line loaded with radial elements behaves like a surface wave line. Phase velocity reduction calculations are limited to cases in which the element diameter does not exceed the length. Gain and phase velocity reduction calculations agree well with the measured values. Measurements indicate that the highest gains are obtained for a small reduction in phase velocity of the surface wave along the antenna structure. When the required reduction is determined for an antenna design, the element size can be obtained by measurements or calculations. The surface wave turnstile antenna is mechanically simple to construct. The radiating elements are automatically phased by their position along the antenna structure. The antenna bandwidth is about 8% of the center frequency and is comparable to other arrays which it might replace. (See also PB 147 926)

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 7, 1 July-30 Sep 57. on Contract DA 36-039-sc-71158. 31 Oct 57, 21p. 12 refs.
Order from LC mi$2.70, ph$4.80 PB 147 928

Measurements were begun on a dielectric disc surface wave antenna. The measurements made were of a preliminary nature in an attempt to discover the factors which are important in determining the gain and pattern shape of this antenna. Two reflector type surface wave antennas were also tried. Both antennas operate on the same principle, but one has horizontal and the other vertical polarization. Patterns of these antennas have been obtained. (Author) (See also PB 147 927)

Wisconsin, U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Quarterly progress rept. no. 8, 1 Oct-31 Dec 57, on Contract DA 36-039-sc-71158. 31 Jan 58, 50p. 13 refs.
Order from LC mi$3.30, ph$7.80 PB 147 929

A surface wave dielectric disc antenna was studied analytically and experimentally. Pattern and gain measurements agreed with predicted values when good surface wave launching efficiency was obtained. Gains of 7.5 db were obtained for reasonable size antenna structures. (Author) (See also PB 147 928)

Wisconsin U., Madison.
SURFACE WAVE AND ANTENNA ENGINEERING RESEARCH STUDY, by Elmer H. Scheibe. Final rept. for 1 Jan 56-31 Mar 58 on Contract DA 36-039-sc-71158. 30 Apr 58, 93p. 26 refs. AD-158 454.
Order from LC mi$5.40, ph$15.30 PB 147 930

The engineering research study was concentrated on 4 types of surface wave (SW) antennas: the SW turnstile antenna, the SW dielectric disk antenna (SWDDA), the SW cone, and SW reflector antennas. The SW turnstile antenna was unidirectional in the horizontal plane and capable of high gain. An approximate analysis was successful in predicting the gain and reduction in phase velocity along the structure. The SWDDA has a unidirectional pattern in the horizontal plane and has moderate gain. An analysis of an ideal SWDDA was successful in guiding the design and experimental measurements. Theoretically, high gain is possible, but because of low SW launching efficiency the maximum gain achieved was 7.5 db for a disk diameter of 24 in. at 9360 mc. The thinner the dielectric, the higher the gain. The cone antenna has a circular horizontal pattern, vertical polarization, and very low gain. The conversion of the SW field to a radiation field was not very efficient. The reflector antennas had considerable less directivity than expected. In actual tests, the antennas showed low gain and poor directivity. A proper combination appeared possible of the horizontal and vertical polarization types of reflector antennas to give circular or elliptical polarization. The SW turnstile antenna was the most successful of all the antennas studied. (Author) (See also PB 147 929)

Ordnance, Missiles, and Satellite Vehicles

AER, Inc. [Pasadena, Calif.]
GROUND INTERFERENCE EFFECTS ON BODIES MOVING THROUGH A COMPRESSIBLE FLUID AND THEIR APPLICATIONS TO SNORT SLED DESIGNS, by T. Y. Wu. Rept. on Contract N123-60530s-4595A. 1 July 58, 111p. 19 refs. NOTS 2118; NAVORD rept. 6420; AD 206 530.
Order from LC mi$6.00, ph$18.30 PB 147 595

Ground interference effects on the pressure distribution and lift, drag, and moment coefficients for various simple 2- and 3-dimensional bodies used in high-speed rocket-test sleds are theoretically determined for the subsonic and supersonic speed flow-regimes. The families of 2-dimensional bodies considered are: (a) single wedges, flat afterbody; (b) double-wedge sections; (c) biconvex sections; (d) thin wings, circulation present; and (e) circular cylinders. Included in the analysis for 3-dimensional bodies in subsonic flow are: (a) slender, pointed, cone-cylinders; (b) slender, pointed ogive-cylinders; (c) double ogives; and (d) finite-span lifting wings. Detached shock wave flows on 2-dimensional bodies (horizontal wedge with a flat afterbody, and upper-sided wedge with a bump on the lower surface) were also considered. This latter analysis indicates that, under certain conditions, pressures of the order of 14 atmospheres may be exerted on the underside of a rocket test sled. Various design plots are also included. (Author)

Aerial Reconnaissance Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
APPLICATION OF TRILATERATION TECHNIQUE TO DETERMINE POSITION OF SATELLITE OR MISSILE IN SPACE, by Lee R. Avery. May 58, 11p. WADC-TN-58-141; AD-155 572.
Order from OTS $0.50 PB 151 136

The trilateration technique described herein provides an extremely accurate method for obtaining a three-dimensional location in space of satellites and other man-made vehicles. It is shown herein that a root mean square accuracy of ±160 feet in space position is obtainable. The timing circuits in the suggested method of measuring require fractional-microsecond accuracy. The achievement of these timing accuracies at widely separated points could impose requirements which would be too severe; however, a time-sharing adaptation of the proposed method could reduce the stringency of this requirement. If the accrual of scientific data requires greater positional accuracy than the present state-of-the-art allows, the satellite-positioning technique described herein is proposed. (Author)

Air Force Missile Test Center, Patrick AFB, Fla.
A BEST ESTIMATE OF TRAJECTORY USING REDUCED DATA FROM VARIOUS INSTRUMENTS AT A SINGLE POINT IN TIME, by Harold L. Dibble and Charles L. Carroll, Jr. May 60, 41p. RCA Quality Analysis Technical rept. no. 10; AFMTC-TR-60-12.
Order from LC mi$3.30, ph$7.80 PB 148 061

The mathematical theory of a single point-in-time method of computing a "Best Estimate of Trajectory" utilizing reduced x, y, z data from two or more instruments is developed using the minimum variance criterion. A technique which has proven adequate for estimation of systematic errors and obtaining an estimate of the best position and best velocity data from several instrumentation systems is discussed. Related topics such as editing of input data, reduction to common tracking point and accuracy of the method are also included. (Author)

Allied Research Associates, Inc., Boston, Mass.
LAUNCHING OF AIRBORNE MISSILES UNDERWATER. PART III. NOTE ON LATERAL HYDRODYNAMIC FORCES DUE TO THE FREE SURFACE, by Theodore R. Goodman. Rept. on Contract Nonr-2343(00). 1 Aug 59, 10p. 1 ref. Document no. ARA-653; AD-219 758.
Order from LC mi$1.80, ph$1.80 PB 147 711

When an airborne missile is propelled from a submerged submarine it must pass from the air environment of the submarine into the water environment of the sea. Subsequently, it must pass from the sea to the atmosphere. Both as it enters and as it leaves the sea it passes through a free surface. The hydrodynamic coefficients and the buoyancy are constant when the missile is fully submerged, but are time-dependent when the missile is in the neighborhood of the free surface. It is the objective of this note to discuss when free surface effects are significant and to derive the variation in the hydrodynamic coefficients during that time. (See also PB 144 117)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE USE OF WIND-MEASURING SET AN/GMQ-17() TO MEASURE THE ROCKET WIND FOR THE HONEST JOHN ROCKET, by Walter Conover. 1 Apr 59, 12p. 3 refs. USASRDL Technical rept. 2024.
Order from LC mi$2.40, ph$3.30 PB 146 293

A theoretical technique is described for using Wind-Measuring Set AN/GMQ-17() (the shooting-sphere anemometer) to measure a weighted low-level wind for the Honest John rocket. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A MULTIPURPOSE OPTICAL TRACKING AND RECORDING INSTRUMENT, by S. M. Lipton. May 53, 20p. 1 ref. Memo. rept. no. 688; AD-18 420.
Order from LC mi$2.40, ph$3.30 PB 148 645

A new tracking telescope type of optical recording instrument was developed for missile programs. The instrument consists of a telescopic main optical system, a motion picture camera, auxiliary guiding telescopes, a mount which moves the telescopes and camera in azimuth and elevation, and auxiliary electrical and electronic equipment. The mount must be capable of 360° azimuth rotation and slightly more than 90° elevation rotation. The instrument may be used as a cinetheodolite of moderate precision since the design and construction of the basic mount provide sufficient accuracy.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
ORBITAL DATA HANDLING AND PRESENTATION, by R. E. A. Putnam. Rept. no. 3 on ARPA Satellite Fence Series. June 59, 12p. BRL Technical note no. 1265.
Order from LC mi$2.40, ph$3.30 PB 146 116

The problem of detecting dark (passive) satellites, utilizing doppler techniques, is accompanied by a need for early satellite identification. The latter requirement necessitates an expeditious handling and classification of orbital data, and a presentation of results in ways that facilitate positive and immediate identification of "strange" satellites. This report is the result of a preliminary study of prospective data handling and presentation procedures. Its purpose is to present the relative merits and limitations of various alternatives proposed, to indicate the particular methods worthy of serious consideration and further study, and to outline the time factors and development costs likely to be involved in procuring prototype equipment. Discussion is limited to a general, rather than to a specific treatment of the subject. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
ON THE USE OF PLASTIC SABOTS FOR FREE FLIGHT TESTING, by L. C. MacAllister. May 54, 27p. 4 refs. Memo. rept. no. 782.
Order from LC mi$2.70, ph$4.80 PB 147 839

A description of the use of sabots to adapt winged and/or finned projectiles for gun-launching in free flight range testing is given. Examples of adaptations for 20mm, 37mm, 57mm, 90mm and 155mm guns are described. (Author)

Bliley Electric Co., Erie, Pa.
PRECISION CRYSTAL UNITS FOR SATELLITE USE, by J. M. Wolfskill and R. T. Schlaudecker. Quarterly progress rept. no. 2, 1 Oct-31 Dec 59, on Contract DA 36-039-sc-84556. [1959] 28p.
Order from LC mi$2.70, ph$4.80 PB 147 975

Development of designs for Phase I experimental units. 5th, 7th, 9th overtone units at 100 Mc Double "V" ribbon channel mounting arrangement. Comparison of gold plated and aluminum plated crystals. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus.
WELDED FABRICATION OF STEEL SOLID-PROPELLANT ROCKET-MOTOR CASES, by M. D. Randall, R. E. Monroe, and P. J. Rieppel. 31 May 60, 29p. 28 refs. DMIC memo. 56.
Order from OTS $0.50 PB 161 206

The purpose of this report is to present information in summary form that deals exclusively with solid-propellant rocket-motor cases, and to make recommendations for the welding of these cases. The materials, joint designs, welding processes, welding conditions, and inspection techniques used to fabricate solid-propellant rocket-motor cases will be discussed. This report is limited to: (1) Unclassified information, (2) Information available at the Defense Metals Information Center prior to February 29, 1960, (3) Full-size production or prototype motor cases. As a result of these limitations, some omissions resulting from the unavailability of specific data are probable.

Diamond Ordnance Fuze Labs., Washington, D. C.
180-HOUR AIRBORNE TIMER, by David S. Bettwy, Rai R. Mamoer, and John Furlani. 4 Mar 60, 22p. 1 ref. Technical rept. TR-767.
Order from LC mi$2.70, ph$4.80 PB 147 784

A lightweight program timer was developed for use in the Army lunar probe missiles. The features of this timer include (1) at least 99-percent accuracy for 180-hr operation; (2) programming of switching functions for two independent circuits; (3) operation under 1000-rpm spin; (4) operation after 100-g launching acceleration; and (5) lightweight (0.41 lb). The minimum accuracy of 99 percent was achieved in laboratory tests at room temperatures. Flight tests in a gravity-free environment would be necessary to determine if the timer can operate properly in space. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
AN OPTICAL CAVITY TRIGGERING SCREEN, by Reinhard R. Ulrich. 20 Dec 59, 16p. 2 refs. TR-654.
Order from LC mi$2.40, ph$3.30 PB 146 341

An optical triggering screen suitable for establishing a precise time and position reference to a point on the trajectory of a projectile in flight has been designed and proved effective. By applying an adaptation of the quasi-parallel light principle, a narrow optical detection region of a uniform width of only 1/8 in. was achieved. The detector is a photomultiplier which looks into a light trap cavity. The output pulse produced by the reflection of light off a projectile as it passes through the detection region may serve to trigger a counter, an oscilloscope or another device. The positional reference can be achieved to an accuracy better than $\pm$ 0.05 in. regardless of the velocity of the projectile. (Author)

Diamond Ordnance Fuze Labs., Washington, D. C.
PRELIMINARY STUDY OF A BALLISTIC RANGING SYSTEM, by O. Dellasanta and D. L. Hamilton. 19 May 60, 24p. TR-840.
Order from LC mi$2.70, ph$4.80 PB 147 163

A preliminary investigation has been made of a ballistic ranging system using a small caliber rifle and associated optical and electronic equipment. Range finding is accomplished by utilizing bullet ballistics; that is, for a given target range a bullet will require a specific time to reach the target. The bullet flight time is determined by magnetically sensing the bullet as it leaves the gun and optically detecting a flash produced by a spotting charge within the bullet as it strikes the target. Tests indicate that the system should give an accuracy of $\pm$ 1 yd at a range of 600 yd and that the spotting charge flash can be detected at distances well over a mile. For many range finding applications the system would be limited only by the operator's ability to hit a target. (Author)

General Electric Co. [Schenectady, N. Y.]
ANALYSIS OF "BOILER" LOX TANK PRESSURIZATION MEANS FOR THE HA-3B, by W. W. Fischer. 10 Apr 53, declassified. 10p. Proj. Hermes Heat Trans. memo. no. 73A.
Order from LC mi$1.80, ph$1.80 PB 147 480

The additional data are the results of thermodynamic calculations. They are presented as a series of tables. Time is utilized as the parameter common to all these tables. The pressurizing gaseous O_2 leaves the vent line and enters the oxidizer tank at the boiler outlet temperature of 290°F.

General Electric Co. [Schenectady, N. Y.]
ANALYSIS OF "BOILERLESS" LOX TANK PRESSURIZATION MEANS FOR THE HA-3B, by Henry J. Sneck and W. W. Fischer. 18 Feb 53, declassified. 20p. Proj. Hermes Heat Trans. memo. no. 72.
Order from LC mi$2.40, ph$3.30 PB 147 478

The calculated thermodynamic data are presented as a series of curves. Included, also, is an approximate comparison of total weight of the systems.

General Electric Co. [Schenectady, N. Y.]
ANALYSIS OF HA-3B OXIDIZER TANK PRESSURIZATION UTILIZING A 0.6 #/sec., 150°F. BOILER OUTPUT, by W. W. Fischer and Nancy D. Fitzroy. 7 Aug 53, declassified. 30p. Proj. Hermes Heat Trans. memo. no. 73B.
Order from LC mi$2.70, ph$4.80 PB 147 481

Object of research was to present the results of a detailed thermodynamic analysis of the Hermes A-3B oxidizer tank pressurization system. Analysis includes prelaunch and powered flight phases of the trajectory. The effects of condensation on the oxidizer tank walls and in the vent line are included as well as the effect of cooling of the pressurizing gas as it flows through the lox vent line from the boiler to the oxidizer tank. Conduction along the oxidizer tank wall and to the forward head, and transient temperature distributions in the tank walls and in the forward head are also included.

General Electric Co. [Schenectady, N. Y.]
COOLING OF HYDRAULIC FIN SERVO MECHANISM, by David J. Masson. 28 Jan 53, 3p. Proj. Hermes Heat Trans. memo. 68A.
Order from LC mi$1.80, ph$1.80 PB 147 473

General Electric Co. [Schenectady, N. Y.]
COOLING OF HYDRAULIC FIN SERVO MECHANISM FOR A-3B, by David J. Masson. 7 Apr 53, declassified. 3p. Proj. Hermes Heat Trans. memo. no. 68C.
Order from LC mi$1.80, ph$1.80 PB 147 474

General Electric Co. [Schenectady, N. Y.]
ESTIMATE OF ELECTRONIC EQUIPMENT SERVICE DURING TESTING FOR HA-3A MISSILES, by Glen E. McIntosh. 12 Jan 53, 2p. Proj. Hermes Heat Transfer memo. no. 70.
Order from LC mi$1.80, ph$1.80 PB 147 476

General Electric Co. [Schenectady, N. Y.]
ESTIMATION OF TEMPERATURE VARIATIONS IN THE ODOMETER COMPARTMENT DURING FLIGHT HA-3A ROUNDS #5-#8, by W. D. Breingan and W. W. Fischer. 31 Oct 52, declassified. 3p. 3 refs. Proj. Hermes Heat Transfer memo. no. 62.
Order from LC mi$1.80, ph$1.80 PB 147 466

General Electric Co. [Schenectady, N. Y.]
ESTIMATION OF TEMPERATURE VARIATIONS IN THE ODOMETER COMPARTMENT DURING FLIGHT HA-3A ROUND #9 ONWARD, by W. D. Breingan and W. W. Fischer. 3 Nov 52, declassified, 5p. 4 refs. Proj. Hermes Heat Trans. memo. no. 63.
Order from LC mi$1.80, ph$1.80 PB 147 467

General Electric Co. [Schenectady, N. Y.]
FORCE AND MOMENT CHARACTERISTICS OF A-3B JET VANE, by R. E. Geiger. Rept. on Project Hermes, Contract [DA 30-115-ORD-23]. 29 Dec 53, declassified 28 May 58, 18p. Proj. Hermes A-3B Aerodynamic data memo. no. 18C.
Order from LC mi$2.40, ph$3.30 PB 146 186

This memorandum supersedes A-3B Aerodynamic Data Memoranda 18, 18A and 18B. It presents the latest estimates of all important jet-vane force and moment characteristics. These characteristics include lift, drag, chordwise center of pressure, spanwise center of pressure, base force and couple produced by base forces. In addition the approximate effect of jet-vane erosion upon lift and drag is presented.

General Electric Co.[Schenectady, N. Y.]
INSULATION OF DESTRUCTOR AND PRIMACORD LEADS FOR EMERGENCY FLIGHT INTERRUPTION DEVICE, RV-A-10, by David J. Masson. 19 Nov 52, declassified. 3p. Proj. Hermes Heat Transfer memo. no. 65.
Order from LC mi$1.80, ph$1.80 PB 147 469

General Electric Co. [Schenectady, N. Y.]
PRELIMINARY ESTIMATION OF TRANSIENT TEMPERATURES IN TAIL COMPARTMENT DURING PRE-LAUNCH TESTING, HA-3B, by Helen G. Bass. 27 Jan 53, declassified. 5p. Proj. Hermes Heat Transfer memo. no. 69.
Order from LC mi$1.80, ph$1.80 PB 147 475

General Electric Co. [Schenectady, N. Y.]
TEMPERATURE TESTS OF BEACON RESISTOR BOX, by Robert W. Ottaway and Glen E. McIntosh. 16 Dec 52, 2p. Proj. Hermes Heat Transfer memo. no. 67.
Order from LC mi$1.80, ph$1.80 PB 147 471

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE EQUATIONS OF MOTION OF A TUMBLING RE-ENTRY BODY, by E. F. Dobies. Rept. on Contract DA 04-495-ORD-18. 22 Nov 57, 15p. Progress rept. no. 20-339; AD-159 890.
Order from LC mi$2.40, ph$3.30 PB 148 384

A set of equations are presented which may be used to describe the re-entry trajectory of a coasting tumbling rocket. The equations of motion are kept as general as possible, with the exception that the azimuth coordinate is linearized, and coriolis and magnus forces are neglected. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
MINIMUM TRANSFER TIME FOR A POWER-LIMITED ROCKET, by George Leitmann (U. of California). Technical memo. 14 Aug 59, 38p. 41 refs. LMSD-49769; AD-225 924.
Order from LC mi$3.00, ph$6.30 PB 147 680

The problem considered is that of determining the acceleration program leading to minimum transfer time for a power-limited rocket moving between prescribed positions and velocities in a constant gravitational field. It is found that flight must take place at maximum power and that the acceleration components are linear functions of time. The case of rectilinear transfer between positions of rest is treated in detail, and the results are compared with those previously obtained for a constant acceleration transfer. (Author)

Marine Corps Development Center, Quantico, Va.
4.2 INCH MORTAR KIT FOR LVTP6; TEST OF, by A. J. Honeycutt. 2 Dec 57, 16p. MCEB Proj. no. ET-1211; AD-149 141.
Order from LC mi$2.40, ph$3.30 PB 148 253

During the initial firing tests, the following deficiencies occurred: loss of torque in the beam and platform bolts, enlarged traverse lock ring holes, and failures in the block clamp assembly. The deficiencies necessitated temporary suspension of the service test and return of the carrier and the test kit to the contractor for modifications to correct the deficiencies. Subsequent to the modifications being made, engineer tests conducted at Yuma Test Station, Arizona, encountered the same deficiencies that existed during the service test. (Author)

Naval Ordnance Test Station, China Lake, Calif.
PERIODIC SURFACES AND SATELLITE ORBITS, by Stephen P. Diliberto. 1 May 59, 99p. 4 refs. NOTS TP-2153; NAVORD rept. 6445; AD-220 842.
Order from LC mi$5.40, ph$15.30 PB 148 042

A mathematical study of conservative dynamical systems is presented. For the types of systems under consideration the problem studied is that of determining integrals in addition to the energy integral - or equivalently of reducing the order of the equations. A new technique for determining a suitable coordinate system is developed. When applied to the problem of satellite orbits it is shown that certain earlier conclusions are true, but for a wider class of orbits than previously considered. (Author)

Naval Research Lab., Washington, D. C.
THE ACOUSTICAL SPECTRUM AS A TOOL FOR INVESTIGATING THE IMPACT SENSITIVITY OF EXPLOSIVES, by R. C. Bowers and J. B. Romans. Final rept. 9 May 60, 10p. 12 refs. NRL rept. 5466.
Order from LC mi$1.80, ph$1.80 PB 145 242

It has been found possible to use the acoustical spectrum as a tool to distinguish quantitatively between detonation and failure of certain explosive compositions in an impact-sensitivity test machine. The greater resolution obtained by this method is particularly useful when partial decomposition results in low-order explosions that make detection by presently used methods most difficult. Because of the superior resolving power of the method employed, RDX explosive compositions will appear to be more sensitive than when determined by conventional methods. The apparatus consisted primarily of a microphone, an oscilloscope, a sweep-timing mechanism, a sound-conducting tube, and a camera for permanently

recording the sound spectra. Successful use of the apparatus in a study of the mechanisms involved in the the desensitization of RDX explosive compositions revealed that it was possible to make measurements of the time delay between impact and explosion, to record instantaneous sound pressures, and also to estimate the propagation rate of decomposition of the explosive. Study of these properties in greater detail and an investigation of the ultrasonic spectrum would be possible by modifying the apparatus. (Author)

Naval Research Lab., Washington, D. C.
MINITRACK DATA FOR THE ARTIFICIAL EARTH SATELLITES 1958 ALPHA AND 1958 BETA FROM 7 MAY 1958 TO 20 MAY 1958, by W. M. Hocking. Project Vanguard rept. no. 32, Minitract rept. no. 5. 22 Sep 58, 47p. NRL rept. 5198.
Order from LC mi$3.30, ph$7.80 PB 146 092

The information necessary to permit satellite orbit computations from raw Minitrack data is given, and the Minitrack data on the satellites 1958 Alpha and 1958 Beta for the period 7 through 20 May 1958 are presented in appendixes. It is intended that the use of these data will encourage and facilitate the development of new computation techniques. The basic Minitrack measurement and the data message itself are described, and a discussion is made of the handling and preparation of the data message for the Vanguard IBM 704 computer.

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
THE DESIGN OF INFRARED EQUIPMENT FOR SATELLITE DETECTION, by Carl F. Borchert. Scientific rept. no. 1 on Contract AF 19(604)4547. Sep59, 67p. 3 refs. Technical rept. 379; AFCRC-TN-60-255.
Order from LC mi$3.90, ph$10.80 PB 147 907

The problem of observing satellite vehicles with an infrared detector is discussed with emphasis on the design of an optimum ground based detection system. Near infrared radiation due to the passage of a satellite is assumed. Theoretical considerations for obtaining the maximum signal-to-noise ratio from the detecting element are presented with a preliminary comparison of several methods of attack. Consideration is also given to optical systems with large collector diameters and large fields of view. Some preliminary experiments are described. (Author)

Rock Island Arsenal Lab., Ill.
CHARACTERISTICS OF VCI MATERIALS WHEN APPLIED AS PACKAGING MEDIA, by Linden H. Wagner. 6 Apr 60, 18p. Rept. no. 60-1051.
Order from LC mi$2.40, ph$3.30 PB 147 431

This report covers results observed during final examination of Cal. .30 M1 Carbines and component parts after three years in open exposure (tarpaulin covered). These carbines had been packaged in four different volatile corrosion inhibitor materials meeting the requirements of Military Specification MIL-P-3420. There was no evidence of rust on the metallic surfaces of the carbines, slings, magazines, and the oilers. The VCI materials afforded adequate protection during the exposure periods. Each weapon was in a "ready to issue" condition. (Author)

Rock Island Arsenal Lab., Ill.
INVESTIGATION OF HYDROPNEUMATIC RECOIL MECHANISM PACKING SPRING LOADS, by L. R. Raisbeck. 14 Apr 60, 33p. 6 refs. Rept. no. 60-1149.
Order from LC mi$3.00, ph$6.30 PB 147 730

Conventional packings for the 75 MM Pack, 105 MM, 155 MM and 8 Inch Howitzer Hydropneumatic Recoil Mechanism floating pistons were tested in a laboratory fixture to determine the relationship between axial packing load and radial packing pressure at sub-zero, normal, and elevated temperature. Tests were conducted with leather-silver-rubber and Teflon-aluminum-rubber packings. Both types of packings were tested in a 105 MM Howitzer Hydropneumatic Recoil Mechanism to determine the relationship between Belleville spring load and their sealing effectiveness at sub-zero, normal and elevated temperatures under dynamic conditions.

Underwater Explosives Research Lab., Woods Hole Oceanographic Institution, Mass.
PHOTOGRAPHY OF UNDERWATER EXPLOSIONS, II. SUPPLEMENT: PHOTOGRAPHIC STUDIES OF SMALL CHARGES OF BLASTING GELATIN, by J. C. Decius and Elijah Swift, Jr. 15 Sep 47, 13p. 5 refs. NAVORD rept. 416.
Order from LC mi$2.40, ph$3.30 PB 148 667

Both single picture and motion picture techniques have been employed in these experiments. The equipment has been described in previous reports, the only important modifications being the omission of the flash-charge illumination in the case of the single photographs and the use of the motion picture rig at a greater depth than any previously attained. This latter depth was about 900 ft.

Virginia Agricultural Experiment Station, Blacksburg.
MULTIVARIATE SEQUENTIAL PROCEDURES FOR TESTING MEANS, by J. E. Jackson and R. A. Bradley. Technical rept. no. 10 on Development of Statistical Methods for Experimental Designs in Quality Control and Surveillance Testing, Contract Nonr-2352(01). Aug 59, 136p. 51 refs. AD-225 594.
Order from LC mi$6.90, ph$21.30 PB 148 193

Multivariate sequential inspection schemes are derived for the characteristic averages both for the case where the population variance-covariance matrix is known or assumed to be known, and where it must be estimated from the sample. When the covariance matrix is known, a sequential X^2-test is developed; when the covariance matrix is estimated from the sample, a sequential T^2-test is developed. A review is given of the pertinent literature concerning sequential analysis, the X^2- and T^2-distributions, and some hypergeometric functions. The sequential X^2- and T^2-tests are derived and the related mathematical proofs dealing with the existence and termination of these procedures are given. Some general discussions are given of topics associated with applications of the methods, i.e., the expected sample size required for the procedures, the extension of these procedures to some other multivariate situations, and the problem of relating tolerances to the specifications of the procedures. (Author)

Watertown Arsenal Labs., Mass.
CORRELATION OF TOUGHNESS BETWEEN H-PLATE AND CHARPY IMPACT TESTS, by W. P. Hatch, Jr. Sep 59, 32p. 4 refs. WAL TR 112/96; AD-225 832.
Order from OTS $1.00 PB 151 850

This report covers a post-ballistic metallurgical examination of a series of H-plates made from high and low harndess armor plate of different chemistries. Examination included chemical analyses, macro and microexamination, hardness surveys, and Charpy V notch transition tests of the armors both welded and unwelded. A correlation between transition data and ballistic performance of the H-plates is indicated. (Author)

Sanitation and Safety Engineering

American Machine and Foundry Co., Alexandria, Va.
DEVELOPMENT OF A UNIT FOR RECOVERY OF WATER AND DISPOSAL OR STORAGE OF SOLIDS FROM HUMAN WASTES. PART I. THE STUDY PHASE, by J. D. Zeff and R. A. Bambenek. Rept. on Contract AF 33(616)5783. Nov 59, 55p. 19 refs. WADC Technical rept. 58-562(I).
Order from OTS $1.50 PB 161 809

This report summarizes the results of a laboratory evaluation utilizing known techniques of water purification. Urine and feces were introduced as raw material, and the recovered water was analyzed for solid content, presence of bacteria, color turbidity, pH, and odor. Results of the water analyses indicate that techniques employing a change of phase are best for recovering water from human wastes. A design evaluation of the most successful laboratory techniques was then undertaken. The design considerations indicate that a vacuum distillation system is advantageous on a weight basis, providing the duration of flight is longer than three days and the number of crew is not more than two men. Compression distillation was found to be advantageous if the number of crew was larger than two and the duration of flight longer than seven days. It was found that vacuum distillation can utilize the excess heat of the cabin as energy, whereas the compression distillation energy requirement is ten watts of electrical energy per man per day. (Author)

Electric Boat Div., General Dynamics Corp., Groton, Conn.
SELECTION OF AN ALGA FOR A PHOTOSYNTHETIC GAS EXCHANGER, by R. J. Benoit, F. Trainor, and A. Bialecki. Rept., Phase I, 16 Mar 15 July 59, on Equipment for Life Support in Aerospace, Contract AF 33(616)6344. Feb 60, 36p. 16 refs. WADD Technical rept. 60-163.
Order from OTS $1.00 PB 161 806

A detailed survey of the plant kingdom and an examination of the requirements for an effective photosynthetic gas exchanger for closed-cycle ecological systems reveal that the unicellular nonmotile (coccoid) algae stand out above all other plant forms for use in an apparatus employing a suspension of cells in a liquid growth medium. The possibility of the effective use of a system in which plants are grown on moist surfaces is explored. Of the few strains or species of coccoid algae that are well studied, a thermophilic strain of Chlorella seems to have the best combination of desirable characteristics for the closed cycle application. Nevertheless, an intense industrial-scale screening program for the discovery of even better strains of algae is suggested. (Author)

Northwestern Technological Inst., Evanston, Ill.
A NEW METHOD OF WASTE DISPOSAL FOR ISOLATED SITES IN THE ARCTIC. II, by John A. Logan. Rept. for 30 Sep-31 Dec 58 on Contract AF 41(657)207. May 59, 10p. Technical note AAL TN-59-6; AD-230 844.
Order from LC mi$1.80, ph$1.80 PB 146 118

Burner tests were conducted to determine requirements for a prototype oil carriage waste disposal unit. A metering system incorporating a positive displacement pump with a variable speed control was designed to replace the pressurized orifice metering system. The new system was operated for 6 hr with the sludge-oil slurry. The sludge-paper-oil slurry was burned for 5 hr at concentrations from 2 to 25% waste. The rotary cup tended to clog within about 15 min when concentrations approaching 20% were used. Fibrous waste components which accumulated behind the impeller and in the cup were easily removed. The fibrous accumulation appeared only with high concentrations, but the runs were of short duration. At low concentrations (10% or less) the oil appeared to scavenge the cup completely. Six hours running at these low concentrations seemed to indicate that clogging did not occur. Combustion appeared to be no problem with ground garbage.

Rome Air Development Center, Griffiss AFB, N. Y.
SPRAY-IN-PLACE SHELTERS, by Anthony F. Gurdo, Joseph M. Schramp and others. Mar 60, 33p. RADC-TN-60-40.
Order from OTS $1.00 PB 161 780

This report covers in-the-house efforts to develop a field fabrication kit for erecting personnel and/or storage shelters on site in-the-field. It describes fabrication techniques, equipments, and materials used and the structural design analysis used as a criteria for a specific configuration fabricated. (Author)

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Army Engineer Research and Development Labs., Fort Belvoir, Va.
EXPERIMENTAL PACKAGING FOR PROJECT MASS, by T. R. Eiler. 26 Jan 60, 37p. Rept. 1617-TR.
Order from LC mi$3.00, ph$6.30 PB 147 845

The following conclusions are applicable to the packaging of CE small repair parts for supply to troops in Europe by a MASS type of operation: (a) compared to present overseas packaging practice, only minimum preservation is required for MASS operations; (b) significant economy and simplification of packaging

result from reduced preservation and packing; (c) all methods tested are compatible with current depot packaging facilities and procedures; (d) eight of the 46 preservative methods tested will provide adequate preservation for most parts; (e) mode of shipment was not a determining factor in the performance of the methods of preservation; (f) the absolute minimum preservation required was not determined because of the negligible failure rate of all tested preservation methods; (g) shipping containers of water-resistant fiberboard are adequate for most shipments; (h) wood boxes can be replaced as containers for most consolidated loads up to 600 pounds by triple-wall fiberboard boxes; and (i) shipping containers in excess of 15-cubic-foot capacity are seldom required. (Author)

Food

Arctic Aeromedical Lab., Ladd AFB, Alaska.
EFFECT OF REPEATED FREEZING AND THAWING ON "C" RATIONS, by Jack D. Douglas. May 59, 7p. Technical note AAL-TN-59-7; AD-230 845.
Order from LC mi$1.80, ph$1.80 PB 146 117

A pilot study was undertaken to determine the extent of damage to C ration cans incurred during the process of freezing and thawing. Results indicated that the freezing of C ration components does not produce mechanical damage to the cans in which these components packed. Freezing does produce a physical breakdown in the components which results in a ration of lowered palatability. It was felt that freezing per se of C rations did not create a hazard to health. The physical changes produced when coupled with improper handling of the rations could facilitate bacterial action.

Naval Supply Research and Development Facility, Bayonne, N. J.
EFFECT OF COOKING AND BAKING PROCESSES ON THE STERILIZATION OF FOOD CONTAMINATED WITH BACTERIAL SPORES, by Richard R. Barton. Final rept. on Shipboard Subsistence, Proj. NT002024(CR53-89). 10 Aug 53, 43p.
Order from LC mi$3.30, ph$7.80 PB 148 038

The object of the work is to determine the ability of standard cooking procedures to sterilize foods contaminated with spores of the non-toxic bacteriological warfare simulant, Bacillus globigii. Modifications of standard cooking procedures will be developed for those foods which cannot be sterilized with standard procedures.

Vanderbilt U. School of Medicine, Nashville, Tenn.
LONG-TERM DOG FEEDING EXPERIMENT ON IRRADIATED CHICKEN, BEEF, AND JAM, by Frank R. Blood, William J. Darby and others. Progress rept. no. 1, 1 Feb 57-17 Mar 58, on Contract DA 49-007-MD-779. [1958] 14p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 148 056

Forty AKC registered beagle puppies were obtained from the Harris Hill Kennels, Elmira, New York. Seven male and seven female puppies were received 7 November 1957 and thirteen males and thirteen female puppies 13 November 1957. After a period of acclimation, the dogs were randomly divided into nine groups with two females and two males in each group; four animals were held for replacement. Feeding consists of a diet containing 35% solids of chicken, beef, or jam irradiated at 2.79×10^6 rads (X-irradiation), 5.58×10^6 rads (2 X-irradiation), and non-irradiated (control) incorporated with Purina laboratory meal. The feeding is in its twelfth week and no effects due to toxicity of the irradiated foods have been noted. (Author)

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

Arnold Engineering Development Center [Tullahoma, Tenn.]
THE DYNAMIC PERFORMANCE OF EFT-B CLIMATIC PRESSURE CONTROL SYSTEMS, by W. K. McGregor, Jr. and L. F. Burns, Jr. Rept. on ARO, Inc., Contract 40(600)700 S/A 13(59-1). Nov 58, 55p. 2 refs. AEDC TR-58-11; AD-204 622.
Order from LC mi$3.60, ph$9.30 PB 146 114

The transient performance of the climatic pressure control systems of the Engine Test Facility, Basic Plant, has been analytically and experimentally defined and found to be in close agreement. The closed loop frequency response at any operating point of the air side pressure system exhibits an amplitude ratio down 3 db at 2.5 rad/sec and the exhaust pressure system down 3 db at 4 rad/sec. The maximum rates of change of pressures available for trajectory testing are dependent upon engine weight flow and can be calculated. Agreement of the calculation with experimental values is demonstrated, and an expedient method is devised to predict these rates. Typical maximum rates for a 200 lb/sec engine are exhaust pressure rate +1.5 and -2.1 psi/sec and air side pressure rate +0.5 and -0.4 psi/sec. Either inlet or exhaust pressure systems are capable of recovering to within two percent of setpoint in less than 10 sec in the case of instantaneous simulated engine flow changes up to 140 lb/sec. For small changes which do not cause the valves to travel to their extreme positions, the recovery time is about 2 sec. Typical engine accelerations introduce transient deviations as high as 2 percent while deviations for instantaneous disturbances may be as high as 20 percent. (Author)

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
HEAT TRANSFER EFFICIENCY OF AUTOMOTIVE ENGINE COOLANTS, by Halkey K. Ross. 17 Mar 60, 26p. 8 refs. Rept. no. CCL-90.
Order from OTS $0.75 PB 161 476

This report investigates the heat transfer properties and thermal capacities of several selected liquid mixtures and explores the possibilities of improving the presently used engine coolants with reference to cooling efficiency. A special calorimeter was constructed and specific heats of glycol-water mixtures,

methanol-water mixtures, and methyl ethyl ketone-water mixtures were determined. An apparatus based on the method described by Hutchinson was built and thermal conductivities of these selected mixtures were determined. There is no promising indication that any worthwhile improvement can be made over presently used coolants with respect to heat transfer efficiency, and no mixture approaches the efficiency of water in the range of operating temperatures in the present internal combustion engines. It is recommended that improvements in heat dissipating efficiency of internal combustion engines be sought in radiator and heat exchanger designs. It may be necessary to make radical departures from the present design of radiators, both in detail and overall configuration and location in the vehicle. The greatest benefit would be realized if a substantial improvement in the thermal efficiency of the engine itself could be realized. (Author)

National Research Labs., Ottawa (Canada).
TURBOJET THRUST AUGMENTATION: FLIGHT TEST RESULTS FROM A REHEAT SYSTEM EMPLOYING FUEL INJECTION UPSTREAM OF A TWO-STAGE TURBINE, by E. P. Cockshutt, D. F. Daw and others. Jan 60, 59p. 12 refs. Aeronautical rept. LR-272.
Order from LC mi$3.60, ph$9.30 PB 147 735

The system was fitted to an Orenda 14 engine installed in a Sabre 6 aircraft. The reheat system was stable over the range of conditions explored, and operated satisfactorily at the ceiling of the aircraft with a tail-pipe static pressure of 3.85 p. s. i. a. A net thrust boost of 32 percent was obtained at a flight Mach number of 0.82. Combustion efficiency decreased slowly from 86 percent at sea level static to 79 percent at 50,000 feet. With the fixed oversize reheat nozzle, consistent relights were obtained up to 45,000 feet (corresponding to an altitude of 52,000 feet with a variable area nozzle in the closed position). Above 45,000 feet, results were erratic. No serious mechanical or performance troubles attributable to pre-turbine injection of the reheat fuel were experienced. (Author)

Princeton U., N. J.
GAS DYNAMIC PROCESSES INVOLVING SUSPENDED SOLIDS, by S. L. Soo. Rept. on Project Squid, Contract Nonr-1858(25). Aug 59, 43p. 9 refs. Technical rept. PR-99-P; AD-227 904.
Order from LC mi$3.30, ph$7.80 PB 147 704

Basic gas dynamic equations involving suspended solid particles were formulated. Considerations include momentum and heat transfer between the gaseous phase and the solid phase. Significance of these contributions was illustrated with the case of expansion through a de Laval nozzle. Duct flow and normal shock problems were also discussed. Extent of earlier methods of approximation were pointed out. (Author)

Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
HEAVY PARTICLE PROPULSION RESEARCH, by Raymond E. Weich, Jr. Rept. for 1 July-31 Dec 59 on Contract AF 49(638)657. [1960] 67p. 4 refs. Rept. RMD-1155-S2; AFOSR-TR-60-48.
Order from LC mi$3.90, ph$10.80 PB 147 519

Earlier work was primarily concerned with the generation of charged heavy particles from the liquid state. Various particle generator cells were tried, all of which performed the dual operation of charge and spray. The experimental work was limited to the generation of charged heavy particles from the solid state. The general problems of particle charging mechanisms and the effect of charge-to-mass ratio distribution upon power-plant performance were theoretically investigated. Based upon theoretical conclusions, an experimental steady flow unit was constructed. The approximate characteristics of the research unit are: mass flow rate ≐ 1 milligram/sec, thrust ≐ 50 to 150 dynes (voltage sensitive), performance ≐ 100 sec (voltage sensitive), and a propellant of iron powder (300 Angstrom mean diameter).

Manufacturing Equipment and Processes

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC WELDING OF STRUCTURAL ALUMINUM ALLOYS. Bi-monthly rept. no. 6, 21 Nov 57-20 Jan 58, on Contract NOas-57-480-c. Feb 58, 3p. AD-161 341.
Order from LC mi$1.80, ph$1.80 PB 148 457

Fatigue test specimens of monometal 5- x 9-3/4-in. panels of 0.050-in. 2024-T3 and 7075-T6 Al alloy are being prepared with 2 rows of staggered welds in the 2-1/4-in. overlap.

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC WELDING SURVEY REPORT AND ULTRASONIC WELDING EQUIPMENT MANUAL, by W. C. Potthoff and H. L. McKaig. Rept. for 1 Dec 57-1 Dec 58 on Contract NOas 58-108-c. May 59, 26p. Research rept. no. 59-106.
Order from LC mi$2.70, ph$4.80 PB 147 625

Alfred U., N. Y.
RESISTANCE HOT PRESSING. Technical rept. on Contract Nonr-2407(00). Aug 59, 30p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 147 689

Resistance hot pressing of multi-component systems of metals, intermetallics and oxides has been developed as a very successful method of producing dense materials. Two types of resistance furnaces have been utilized: one is a water-cooled, metal-enclosed assembly for very rapid pressing in graphite resistance dies; the other uses graphite resistance dies, insulated with ceramic products, and will form much larger specimens. In many aspects, resistance hot pressing offers definite advantages over sintering methods and induction hot pressing. (Author)

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF HIGH TEMPERATURE DIE MATERIALS (HOT DIE MATERIALS) by H. R. Nichols W. H. Graft and others. Final technical engineering rept. for 15 Oct 57-15 June 59 on Contract AF 33(600)35914. Oct 59, 133p. 29 refs. AMC Technical rept. 59-7-579; AD-232 717.
Order from OTS $2.50 PB 161 779

Precision, thin-walled, high-strength steel forgings for high performance aircraft and missiles can be quickly and economically forged in hot dies of Inconel 713-C using a potassium iodide-graphite lubricant-parting agent. The nickel-base casting alloy, (Inconel 713-C) proved superior to a cobalt-base alloy (HE 1049) and four other basic alloy families in oxidation resistance, hot strength stability on aging, hot wear resistance, and compressive deformation strength at temperatures as high as 1600°F. The four other alloy families were ferritic, Fe-Co-W; austenitic, Fe-Cr-W-Ni; austenitic with vanadium, columbium or tungsten carbide; and a superlattice aluminum-bearing austenite. A lubricant-parting agent, powdered potassium iodide and graphite in a ratio of 1:2, increased forging reduction and permitted metal flow at the die-work interface at die temperatures up to 1600°F. Approximately 200 test forgings of one-half of an H-beam section were produced which had a projected area of 25 square inches, including flash. Marked increases in die filling took place as the die temperature increased from 300°F to 1600°F. (Author)

Armour Research Foundation, Chicago, Ill.
METHODS AND CONTROLS FOR PRODUCING CASTABLE DIES FOR FORGING STEEL AND TITANIUM ALLOYS, by Andrew H. Murphy, Harry P. Nichols, and Paul R. Gouwens. Final technical engineering rept. for 10 June 57-10 Mar 59 on Contract AF 33(600)35530. Apr 59, 104p. 49 refs. AMC Technical rept. 59-7-578; AD-227 751.
Order from OTS $2.50 PB 161 778

High performance aircraft forgings of high-strength steels, with long, thin sections, can now be produced with a minimum of costly and time consuming machining. Forging dies capable of operating at 1600°F can be cast with cavities which require no machining. Casting molds made of special graphite mixtures provide excellent surface finish, close dimensional tolerance, finer cast grain size and good internal soundness of the high temperature resistant forging dies. These cast dies can be maintained at operating temperatures up to 1600°F and at pressures up to 80,000 psi. Die filling ability increased as the die temperatures increased, with the most favorable results occurring in the 1200°F to 1600°F temperature range. (Author)

Army Chemical Corps Engineering Command, Army Chemical Center, Md.
ANNUAL STANDARDIZATION SYMPOSIUM [NO. 1] 24 and 25 MARCH 1958, ARMY CHEMICAL CENTER, MARYLAND. [1958] 118p. 3 refs.
Order from LC mi$6.00, ph$18.30 PB 137 561

Contents:
The Chemical Corps contribution to the Department of Defense Standardization Program
ASA and military standardization coordination
History of the Chemical Industry Advisory Board in American Standards Association
How industry can benefit by the Dept of Defense Standardization Program
Standardization in Industry
The effect of the Dept of Defense Standardization Program on the laboratory apparatus industry
Planning and doctrine's interest in standardization
The Defense Standardization Program
The effect of standardization on supply and procurement
Value of properly planned standardization
Antitrust aspects of standardization programs
Basic standardization
The Commodity Standards Division
Experiences in standardization at Eastman Kodak

Avco Corp., Wilmington, Mass.
BERYLLIUM JOINING; RAD SPONSORED PROGRAM, by J. B. Cohen. Rept. for July 58-Oct 59 on Contract AF 33(616)5913. Apr 60, 45p. 23 refs. WADC Technical rept. 59-695, Pt. I.
Order from OTS $1.25 PB 161 830

New brazing techniques are described for joining beryllium to itself. A Be-20 a/o Ag brazing alloy developed under this program is shown to yield joint strengths at room temperature of 60 percent (30,000 psi) of that of the base metal. In the temperature range of 700 to 1450°F, the joint strength is 80 percent that of the base metal. Twenty-four hour exposures at these temperatures did not affect the room temperature strength. Similar strengths are achieved by brazing with pure silver, if a continuous interface of silver in the joint is absent. This is readily accomplished by heat treatment because of the rapid intergranular penetration of silver into beryllium. The resulting thick joint is not deleterious, since it is shown that a two phase silver beryllium alloy with a silver network is ductile. As in the above case, long time exposure (24 hrs) at temperatures above 1300°F did not affect the room temperature joint strength. Spreading of liquid silver on beryllium is not appreciable, probably because of its rapid intergranular penetration. (Author)

Avco Corp., Wilmington, Mass.
BERYLLIUM JOINING; WADC SPONSORED PROGRAM, by E. M. Passmore. Rept. for June 58-Oct 59 on Metallic Materials, Contract AF 33(616)5913. Apr 60, 127p. 25 refs. WADC Technical rept. 59-695, Pt. II.
Order from OTS $2.75 PB 161 831

Joining of beryllium plates and rods by braze welding, fusion welding, and pressure welding was investigated, with the objective of developing improved methods for applications at both room and elevated temperatures. From the work described in this report, it can be concluded that braze welding with silver filler metal and pressure welding without filler offer the most promise as useful joining techniques for beryllium. (Author) (See also PB 161 830)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
PROBLEMS WITH RESTRAINT IN HEAVY WELDMENTS, by Glenn E. Faulkner. 29 Apr 60, 10p. DMIC memo. 54.
Order from OTS $0.50 PB 161 204

One of the important phases of research to evaluate thick titanium plate for use in deep-diving submarines is the evaluation of welded joints in thick titanium-alloy plates. As part of the weld-evaluation program, procedures will be developed for welding 2-inch-thick plates. These plates will be 30 inches long. Restraint in weldments of this size is high. Restraint in welding is the restriction of expansion and contraction during the heating and cooling cycles of welding operations.

Denver Research Inst., Colo.
SURVEY OF THE BROACHING PROCESS, by Bruce Hanna and Charles E. Eppinger. Final technical engineering rept. for Mar-Dec 59 on Contract AF 33(600)39008. Jan 60, 126p. 205 refs. AMC Technical rept. 60-7-645.
Order from OTS $2.75 PB 161 776

An extensive survey of the broaching process was performed to determine current status, problem areas, current efforts at resolution of problems, and needed developments. In addition to a survey of broaching literature, fifty-one organizations were contacted for information. The effect of broach gullets on cutting action and certain characteristic economic considerations were treated analytically. Broaching has been developed into a highly efficient method of metal removal with inherent accuracy and efficiency. Difficult-to-machine high temperature alloys have created broaching problems of which short tool life is the most serious. Current efforts toward resolution are limited in extent. Improved tool materials, broach design information, and comprehensive broach life data are needed. (Author)

[Hermes Electronics Co.] Cambridge, Mass.
FUNDAMENTAL MODE FILTER CRYSTALS, by F. Earle Clark. Quarterly progress rept. no. 3, 21 Nov 57-21 Feb 58, on Contract DA 36-039-sc-73234. 20 June 58, 19p. H. E. Proj. no. F-297.
Order from LC mi$2.40, ph$3.30 PB 147 984

Final development of a spurious mode identification and mapping device is described. Data on both circular and triangular AT plates gathered with the mode mapping device as well as with conventional techniques is presented. Physically identical crystals show individual characteristics to an unexpected degree. Conclusions based on the data are presented including some ideas on the behavior of triangular crystals. Triangular crystals have more freedom from spurious modes than equivalent circular crystals. Reduction of electrode size on both circular and triangular crystals removes some of the drive from spurious modes. (Author) (See also PB 140 600)

Naval Ordnance Test Station, China Lake, Calif.
THE EXPLOSIVE WORKING OF METALS, by John Pearson. 4 Feb 60, 54p. 47 refs. NOTS TP 2421; NAVORD rept. 7035.
Order from OTS $1.50 PB 161 828

Many metal working operations such as the forming, sizing, shaping, cutting, compacting, and welding of parts can now be performed by the energy released from either a detonating or deflagrating explosive. Several of these basic types of operations are currently in use on a production basis, the others are still in the applied research area of investigation. Both open and closed systems are employed with "standoff" and "contact" charges used to develop working pressures ranging from a few thousand to several million psi. Fundamental aspects of pressures, forces, and velocities pertinent to explosive metal working operations are discussed. Material behavior patterns are briefly considered. Several of the above operations are described in some detail. (Author)

Naval Ordnance Lab., White Oak, Md.
X-RAY STANDARDS FOR SHIELDED ARC WELDS IN ALUMINUM, PARTS I AND II, by R. E. Hightower. 28 Apr 53, 2 vols. NAVORD OD-7574.
Order from OTS $30.00 PB 161 833

Part 1: The standards are primarily designed to be applicable to the inspection of mine cases and similar structures fabricated from Aluminum 2S and 3S sheet. Part 2 contains only radiographs in photographic negative form.

Naval [Weapons Plant] Washington, D. C.
LITERATURE SURVEY ON COPPER BASE ALLOY CASTINGS FOR GAS AND HYDROSTATIC PRESSURE APPLICATIONS, by Vincent DePierre and Shingo Inouye. 15 May 59, 40p. 85 refs. NAVORD rept. 6484; NGF T-30-58; AD 219 362.
Order from OTS $1.00 PB 161 777

As the initial part of a task assignment to prepare a specification covering "Copper Base Alloy Castings (For Gas and Hydrostatic Pressure Applications)," a survey of the literature was made on copper base alloy pressure castings. A bibliography was prepared. Defects responsible for leakage in pressure castings, alloys generally used in bronze pressure castings and major factors (melt quality, composition, pouring temperature, mold variables, casting section thickness, and machining) influencing the pressure tightness of these alloys are reviewed. (Author)

Transport, Traction and Hoist Facilities

George Washington U., Washington, D. C.
THE CONCEPTS OF NOTIONAL SHIP AND NOTIONAL VALUE IN LOGISTIC CAPABILITY STUDIES INVOLVING MERCHANT SHIPS, by Ralph B. Hunt and Erling F. Rosholdt. Rept. on Logistics Research Project, Contract Nonr-761(05). 21 Aug 59, 12p. Serial T-103/59; AD-225 901.
Order from LC mi$2.40, ph$3.30 PB 148 156

A primary logistic planning operation is described for determining how many ships are required to transport a given quantity of cargo (dry, liquid, or human) from one point to another according to a particular lift requirement schedule. For studies involving ships, the concepts of a notional ship and of a

notional value of an actual ship are considered. The procedures for determining the number of notional ships for a given lift requirement schedule were previously described (AD-217 232). It is necessary to convert the number of notional ships required over each route to the number of actual ships required. The total actual ship requirements are obtained by applying the concept of the notional value of an actual ship which is a function of the distance (route) over which the ship operates. This factor may be handled 2 ways: (1) to determine the notional value of each actual ship for every route for which the number of notional ships needed were determined, and (2) to decide on a standard reference distance (notional distance) and convert the notional ship requirements, as calculated for the different routes, to the notional ship equivalent at the notional distance selected. An example is worked out using these concepts.

Universal Molded Products Corp., Bristol, Va.
ENGINEERING INVESTIGATION OF RUBBER OR PLASTIC MATERIAL FOR TRUCK COMPONENTS, by LeRoy R. Boggs. Final rept. on Contract DA 20-089-ORD-37127. 20 June 56, 16p. AD-202 133.
Order from LC mi$2.40, ph$3.30 PB 147 593

An engineering investigation was conducted of rubber, reinforced rubber, plastics, reinforced plastics or other materials as superior substitute for metal in the construction of various body parts for the 3/4 ton, 4 x 4 truck. Specified evaluation criteria were as follows: (a) resistance to atmosphere exposure, (b) resistance to fungi, (c) resistance to impact, (d) resistance to flame, (e) lightweight, (f) ease of field repair, (g) production efficiency, and (h) ease of initiating new production. Fiberglass reinforced polyester plastic was the best substitute for metal as a material for typical body components of tactical vehicles such as the M-37 truck. To best utilize the desirable properties of this material, the fundamental design of the application should be made around these properties. For example, if original design of a body component takes into account the low elastic modulus, the fabrication liberties of form, shape and local integral reinforcement and the other unusual properties of this material, then a much more efficient design will result than if a mere material substitution is made in a design originally intended for an entirely different material such as steel. Under such favorable design conditions, there are many applications in which this material would be clearly superior to steel or any other known material. Production of truck body components of this material is feasible in a wide range of quantities. Techniques used in this project represent moderate quantity methods but higher production rates appear equally feasible. (Author)

MATERIALS

[Army Engineer] Waterways Experiment Station, Vicksburg, Miss.
PLASTIC-GLASS FIBER REINFORCEMENT FOR REINFORCED AND PRESTRESSED CONCRETE, by Bryant Mather and R. V. Tye. Summary of information available to 1 July 55. Nov 55, 62p. 78 refs. Technical Memo. no. 6-421, rept. 1.
Order from LC mi$3.90, ph$10.80 PB 148 085

Information on use of glass and reinforcement in concrete is summarized and evaluated. Solid strip glass was studied in Europe in the 1930's but probably is not currently practical. Since 1951 promising studies have been made of glass fiber reinforced plastic rods as prestressing. Glass with relatively low modulus of elasticity, high tensile strength, and low specific gravity should be superior to steel if these properties can be employed conveniently, safely, and consistently. (Author)

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PLASTIC-GLASS FIBER REINFORCEMENT FOR REINFORCED AND PRESTRESSED CONCRETE, by Leonard Pepper and Bryant Mather. Summary of Information Available 1 July 55-to 1 Jan 59. Nov 59, 23p. 19 refs. Technical memo. no. 6-421, rept. 2.
Order from LC mi$2.70, ph$4.80 PB 148 086

Reports of work in Germany and Russia involving fiber glass and information obtained from domestic and foreign agencies, companies, and scientific organizations concerning use of fiber-glass reinforcing and prestressing elements for concrete are summarized. This information suggests the present availability of fiber glass possessing the mechanical characteristics necessary for a prestressing element. However, fiber glass cannot be used for this purpose without adequate protection from surface attack by the environment, and the available fiberglass-reinforced plastic systems do not possess the mechanical characteristics necessary for a prestressing element. Additional experimental work along lines that can now be described should provide the necessary background for specification of fiberglass-reinforced plastic units as an alternate to steel in prestressed-concrete construction. (Author) (See also PB 148 085)

Arnold Engineering Development Center [Tullahoma, Tenn.]
AERODYNAMIC HEATING TESTS AT MACH NUMBER 5 OF NYLON PARACHUTE MATERIAL PROTECTED WITH VARIOUS SUBLIMING COMPOUNDS, by R. L. Palko. Rept. on ARO, Inc., Contract AF 40(600)700 S/A 13(59-1). May 59, 27p. 2 refs. AEDC-TN-59-41; AD-214 595.
Order from LC mi$2.70, ph$4.80 PB 146 113

Samples of nylon parachute ribbons treated with various subliming compounds were tested at Mach number 5, a simulated pressure altitude of 100,000 feet, and a stagnation temperature of approximately 730°F. The melting rates of the ribbons were observed with the aid of high-speed photography, and time histories of the ribbon temperatures were recorded. The apparatus used and typical results are described. (Author)

Office of Technical Services, Washington, D. C.
MATERIALS TESTING (1950-1960). May 60, 16p. 248 refs. OTS Selective Bibliography SB-411.
Order from OTS $0.10 OTS SB-411

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations. Reports are arranged in categories as follows: nondestructive testing; ultrasonic testing; autoradiographic and radiographic testing; and materials testing, general.

Ceramics and Refractories

Armour Research Foundation, Chicago, Ill.
INVESTIGATION OF GRAPHITE BODIES, by Samuel W. Bradstreet, Leon M. Atlas and others. Rept. for 1 Oct 58-1 Nov 59 on Ceramic and Cermet Materials, Contract AF 33(616)6143. Apr 60, 116p. WADC Technical rept. 59-706.
Order from OTS $2.50 PB 161 802

In investigating the influence of composition and processing variables on certain properties of small, molded multicrystalline graphite, non-impregnated specimens have been made at densities above 1.8 gm/cc to exhibit flexural strengths in excess of 350(psi at 20°C and 8000 psi at 2250°C. Concomitant studies have involved techniques of differential thermal analysis and dilatometry in binder investigation, a novel method of measuring tensile strength in brittle ring specimens, measurement of strengths and moduli to temperatures above 2850°C, and additions of a thermal carbon to coke flour as an inter-packing aggregate. The value of furfuryl alcohol polymer as a binder is confirmed. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
AN INVESTIGATION OF THE THEORETICAL AND PRACTICAL ASPECTS OF THE THERMAL EXPANSION OF CERAMIC MATERIALS. VOLUME ONE. LITERATURE SURVEY, by Raymond H. Stutzman, John R. Salvaggi and Henry P. Kirchner. Summary rept. for 1 July 58-31 Aug 59 on Contract NOrd-18419. 31 Aug 59, 162p. 954 refs. Rept. no. PI-1273-M-4; AD-220 685.
Order from OTS $3.00 PB 161 826

A literature survey was conducted on the reversible thermal expansion of crystalline ceramics, rocks and minerals, glasses, cermets, intermetallic compounds salts, cements, glazes, enamels and ceramics combined with other types of materials. Approximately 1200 references were collected of which 954 are assembled in a bibliography. 523 of the articles and reports were reviewed in detail and the results of thermal expansion measurements are published in tabular form (Author)

General Electric Research Lab., Schenectady, N. Y.
LOW-TEMPERATURE BRITTLENESS OF REFRACTORY METALS, by H. W. Schadler and J. R. Low, Jr. Annual summary rept. for 15 June 58-31 July 59 on Contract Nonr-2614(00). Aug 59, 43p. 34 refs. AD-226 968.
Order from LC mi$3.30, ph$7.80 PB 147 720

Dislocation etch pits in tungsten: A study was made of the dislocation etch-pitting technique of Wolff (Acta Met., 6:559, 1958). The study showed that this technique reveals dislocation reproducibly, and that no decoration of the dislocations is required. An etch-pitting technique was developed that employes a stainless steel sheet cathode, and an NaOH electrolyte with the specimen as anode. Electron beam melting: Equipment was constructed for the zone purification of refractory metals; it was used to melt W, Ta, Fe, and Ni. Measurements of electrical resistivity and mechanical properties of W single crystals indicated that purification is accomplished both by vacuum distilling and by zone refining. Deformation behavior of zone-melted W single crystals: Tungsten single crystals grown by electron bombardment floating zone refining were strained 2% in tension and bending at 298°, 77°, and 20°K to determine the modes and crystallography of the plastic deformation. The temperature dependence of the yield strength of W single crystals: The temperature dependence of the yield of W was measured using single crystals of zone-refined W of a variety of orientations. To eliminate the crystal orientation as a variable, the tensile yield strength was converted to a resolved shear stress on slip systems of the type (011) [111]. The average values of the resolved shear stress were a linear function of reciprocal absolute temperature as the theory of Fisher (Trans. Am Soc Metals, 47:451, 1955) predicts.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATION OF HIGH TEMPERATURE RESISTANT MATERIALS, by J. D. Walton and C. R. Mason, Quarterly rept. no. 11, 1 Feb-31 Apr 58, on Contract NOrd-15701. [1958] 35p.
Order from LC mi$3.00, ph$6.30 PB 148 455

Zirconium-carbide- and titanium-carbide-forming thermite reactions were studied with regard to throttling materials (alumina versus kaolin, EPK), binders (core oil versus a saturated solution of aluminum hydroxide), carbon source for carbide-forming (graphite versus lampblack), and various shrouding techniques during ignition. Nozzles fabricated using the thermite reaction between fused silica and aluminum, with fused silica as the throttling material, were too weakly bonded to withstand the physical shock of the start cycle on the small rocket test stand. Nozzles fabricated using the zirconium-carbide-forming thermite reaction with EPK as the throttling material melted rapidly when tested on the small rocket motor. Erratic results were found to be caused by discrepancies in fabricating techniques.

Illinois U., Urbana.
NONDESTRUCTIVE TESTS FOR CERAMIC, CERMET AND GRAPHITE MATERIALS, by Julian H. Lauchner, Dwight G. Bennett, and George L. Morgan. Rept. for 1 July 58-30 June 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5687. Nov 59, 61p. 41 refs. WADC Technical rept. 59-412.
Order from OTS $1.75 PB 161 815

A feasibility study of several nondestructive tests as methods for predicting performance characteristics of ceramic, cermet and graphite materials was carried out. Radiographic identification of internal flaws, penetrant identification of external flaws, density measurements, and residual stress analyses were

employed in nondestructive evaluation. In the absence of viscous or plastic flow, external flaws were found to markedly affect material strength, whereas internal flaws were, in some cases, found to be of secondary importance. Residual stress developments in composite bodies were analyzed. Thermal expansion, elastic moduli, shape factors and heat treatments were employed. Such residual stress was observed to be a first order factor in predicting performance characteristics. Static strengths of alumina bodies correlated well with particle sizes as determined by X-ray back reflection. (Author)

Linde Co., Indianapolis, Ind.
RESEARCH INVESTIGATION TO DETERMINE THE OPTIMUM CONDITIONS FOR GROWING SINGLE CRYSTALS OF SELECTED BORIDES, SILICIDES AND CARBIDES, by A. D. Kiffer. Rept. for Mar 59-Feb 60 on Ceramic and Cermet Materials, Contract AF 33(616)6326. Apr 60, 31p. 8 refs. WADD Technical rept. 60-52.
Order from OTS $1.00 PB 161 792

This work was undertaken to produce selected crystals in the refractory hard metals class for mechanical and other property determinations. A Verneuil-type process using an arc heat source and argon shield gas was employed. Single crystal boules of titanium diboride and tungsten disilicide, 1/4-inch diameter and up to 4-1/2-inches long, were made. Most of them cracked upon cooling. The largest single crystal pieces recovered were 1/4-inch diameter and over 1/2-inch long. Dimolybdenum carbide boules had large sections of a "single crystal" Mo_2C matrix containing about 10% by volume of another phase distributed uniformly through it. No Mo_2C single crystal pieces free from this phase were made. In very limited work with ditungsten pentaboride only polycrystalline boules were produced. A major problem was encountered in getting powders suitable for Verneuil-type crystal growth. Best results were obtained from compounds prepared by fusing together commercially available pure elements and crushing the lumps into a suitable particle size fraction. Process improvements and purer powders are required to produce better quality TiB_2 and WSi_2 crystals. More experimental information is required on the molybdenum-carbon and the tungsten-boron systems. (Author)

Fuels, Lubricants, and Hydraulic Fluids

Army Chemical Warfare Labs., Army Chemical Center, Md.
AMMONIUM NITRATE FUEL BLOCKS, by Edward P. Cole. Rept. for Mar 54-Mar 55. Feb 60, 26p. Special Pub. 1-10; AD-234 129.
Order from LC mi$2.70, ph$4.80 PB 147 626

The object of the work described in this report was to determine whether the physical variables inherent in the procedure for loading AN-M7 smoke-pot fuel blocks had any noticeable effect on the observed tendency of the blocks to swell during storage. No relationship was found between consolidation pressure, ram dwell time, or the presence of a cellulose-nitrate disk seal, and the tendency of fuel blocks to swell. There was a correlation between slight swelling and (1) the addition of 2% water to the fuel mixtures prior to consolidation and (2) consolidation of the fuel mixture in one increment instead of two. It was also found that the starter mixture showed signs of swelling, that blocks having a concave top surface swelled, and that "fast" (MIL-STD-545) fuel mixtures showed considerably greater swelling than pure ammonium nitrate blocks. All the miniature fuel blocks used in the experiments swelled after storage. No change in the physical variables inherent in the loading procedure of fuel blocks is capable of completely eliminating the tendency of ammonium nitrate fuel blocks to swell. (Author)

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
THE APPARENT ORDER OF HETEROGENEOUS SPRAY REACTIONS, by F. A. Williams. [Technical] rept. no. 27 on Contract DA 04-495-ORD-446. Sep 58, 7p. 5 refs. AD-203 812.
Order from LC mi$1.80, ph$1.80 PB 138 160

The order and rate of a heterogeneous reaction involving liquid or solid particles in a gaseous medium are sometimes measured in devices which produce a steady flow of the heterogeneous mixture. It is proposed to show that the apparent order of the reaction (with respect to the material composing the particles) obtained in this manner is primarily a function of the particle size distribution and is largely independent of the single-particle reaction order.

Massachusetts Inst. of Tech., Cambridge.
HYDROGEN PEROXIDE LABORATORIES, by W. C. Schumb and C. N. Satterfield. Quarterly periodic status rept. on Contract Nonr-1841(11). 30 June 59, 14p. AD-220 223.
Order from LC mi$2.40, ph$3.30 PB 146 281

Stability studies: A study of the decomposition rates of dilute solutions of H_2O_2 was begun in an attempt to establish the true shape of the decomposition rate vs concentration curve; principal consideration was given to the 5 to 30% concentration range. Although a moderate variance in results occurred, a gradual increase in decomposition rate was indicated as the H_2O_2 concentration decreased. H_2O_2 decomposition flame at subatmospheric pressures: The best cleanliness, mechanical flexibility, and temperature controllability of the boiler flask was obtained with a 6-ft, 108-w heating tape. There were no marked improvements in preventing ignitions of the solution in the boiler, nor in the behavior of the boiler flask system. A ground, fointed Y-connection was added to the side arm of the boiler flasks to decrease the pressure fluctuations in the boiler. Porous-walled reactor studies: Carbon dioxide was more effective than N as an injectant into the H_2O_2 decomposition system. The surface rate constant for H_2O_2 decomposition ranged from 1.6 to 2.2×10^{-4} g mol/sq cm(min) (atm) when CO_2 and N, respectively, were used as carrier gases with no injections. Decomposition of H_2O_2 vapor on catalytic surfaces: Two sets of runs were made to determine the combinations of temperature, velocity, and H_2O_2 concentration under which mass transfer is not con-

trolling on an active catalyst surface (silver). At 50°C the ratio of experimental rate to that for the mass transfer which was controlled averaged 0.46; at 40°C the average was 0.27. One-fourth of the H_2O_2 entering the tube decomposed. (See also PB 139 967)

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
STORAGE STABILITY OF FLUIDS AND LUBRICANTS. PART II. ROOM TEMPERATURE STORAGE OF AIRCRAFT GREASES, by John B. Christian. Rept. for June 55-June 57 on Transmission Technology. Apr 60, 20p. 5 refs. WADC Technical rept. 58-287, Pt. II.
Order from OTS $0.50 PB 161 808

Eleven greases qualified under Military Specifications MIL-G-3278, MIL-L-3545, MIL-L-4343, MIL-G-7421, and MIL-L-7711, and supplied by various manufacturers were placed in storage at room temperature for two years. The greases were examined periodically to determine if storage had affected any of their properties. At the termination of two years of storage, it was discovered large changes in consistency had occurred in three out of four Specification MIL-L-7711 greases. The properties of these greases were no longer within specification limitations. All other greases maintained minimum requirements. (Author)

Naval Boiler and Turbine Lab. [Philadelphia, Pa.]
EVALUATION OF "COSAG" FUELS, by H. E. Meyer. Evaluation rept. 20 Feb 58, 40p. NBTL Test P-305; AD-205 997.
Order from LC mi$3.00, ph$6.30 PB 146 292

Twenty-two distillate type fuels were subjected to laboratory examination; three of these fuels to full scale boiler tests. The laboratory results showed that all fuels were adversely affected by sea water contamination; some indications of incompatibility also were encountered. Meter and pump failures and sprayer plate erosion represent the principal difficulties requiring design studies before the adoption of such fuels for naval use. A specification for ash-free fuels suitable for under boiler service was formulated

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON LUBRICANTS AND HYDRAULIC FLUIDS, by S. L. Cosgrove. Rept. on Contract AF 33(616)5171. 30 Apr 58, 80p. 50 refs. REIC rept. no. 4; AD-154 432.
Order from LC mi$4.50, ph$12.30 PB 147 102

This report presents the state of the art of the effect of nuclear radiation on aircraft lubricants and hydraulic fluids from 1955 through 1957. A brief review of the mechanism by which organic materials degrade chemically under the influence of nuclear radiation is followed by a discussion of the radiation stability of current aircraft lubricants and hydraulic fluids. In general, military-specification aircraft lubricants and hydraulic fluids show inadequate radiation stability for projected ANP purposes. The incorporation of antirads into these materials does not provide the necessary additional stability. Aromatic compounds, specifically alkyl biphenyls, and substituted aromatic ethers, show the most promise as radiation-resistant base stocks. In most cases their performance properties have yet to be fully evaluated, especially under in-source, or dynamic irradiation, conditions. Lubricants are categorized by function; radiation-resistant lubricant and hydraulic-fluid development programs are reviewed by chemical species rather than by the contracting agency responsible for their development. The appendixes contain selected tabular data showing the effects of radiation on both conventional materials and those developed for projected ANP use. (Author)

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON LUBRICANTS AND HYDRAULIC FLUIDS (FIRST ADDENDUM) by S. L. Cosgrove. Rept. on Contract AF 33(616)5171. 31 Mar 59, 51p. 42 refs. REIC rept. no. 4 (Addendum); AD-210 760.
Order from LC mi$3.60, ph$9.30 PB 147 102-S-1

This report reviews publications, reports and other communications received during 1958. Those basic radiation studies on organic compounds of significance to lubricant and hydraulic fluid development are reviewed, and their significance is discussed. Radiation-resistant gas-turbine-lubricant development during the past year has centered around the expanded study of polyphenyl ethers and alkylated aromatic ethers. Meta-linked polyphenyl ethers (uninhibited) show promise for use in the 0 to 700 F range and at exposures up to 1×10^{11} ergs g^{-1}(C). Alkylated aromatic ethers (containing antioxidants) are somewhat less radiation stable, but show a useful temperature range of approximately -35 to 600 F. Alkylated diphenyl ethers and diaryl alkanes show the most promise for use in conventional hydraulic systems under irradiation conditions. In hydraulic systems which would tolerate high pour points (about 5F) and marginal high-temperature viscosity, unsubstituted polyphenyl ethers could be used to advantage. The combination of radiation-stable fluids and modified soap (terephthalamates) or nonsoap thickeners has resulted in greases of adequate radiation stability for anticipated ANP needs. Likewise, commercially available dry-film lubricants show adequate radiation stability for anticipated ANP applications. (Author) (See also PB 147 102)

Rock Island Arsenal Lab., Ill.
A STUDY OF THE LUBRICITY OF A SULFURIZED COATING, by G. P. Murphy and F. S. Meade. 26 Apr 60, 10p. 2 refs. Rept. no. 60-1308.
Order from LC mi$1.80, ph$1.80 PB 147 731

Test specimens were sulfurized by a commercial firm. The lubricity of the coating was evaluated both dry and with a mineral oil. The coating was also evaluated as a pretreatment for resin bonded dry lubricants. When the sulfurized specimens were evaluated dry for wear resistance and antiseizure, it was determined that the sulfurized coating offered no improvement in wear resistance and only slight improvement in antiseizure when compared with plain steel specimens. However,

as a pretreatment for both oil and resin bonded dry lubricants, the sulfurized coating was superior to both plain steel and zinc phosphated (MIL-C-16232, Type Z) steel with regard to wear resistance. The antiseizure characteristics of the sulfurized coating was superior to the plain steel and equivalent to zinc phosphated steel. (Author)

Plastics

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
TRAINING COURSE AND INSTRUCTIONS FOR FOAMING-IN-PLACE AND THERMAL-FORMING REPAIR OF FOAMED STRUCTURES, by H. R. Moore and R. A. Coen. 8 Feb 55, 23p. 10 refs. Rept. no. NADC-EL-54151; AD-126 873.
Order from LC mi$2.70, ph$4.80 PB 138 073

This report was prepared to describe a training course and the necessary instructions on foaming-in-place and thermal-forming techniques for repairing the two main classifications of damage encountered by foamed structures, namely: (1) Damage to core accompanied by rupture of one or both skins. (2) Delamination of core from skin, not requiring replacement of skin or core by patching.

Army Engineer Research and Development Labs., Fort Belvoir, Va.
EFFECT OF AN EMBOSSED PATTERN ON THE RIGIDITY OF PLASTICS, by Paul A. Signet. 15 Oct 58, 10p. Rept. no. 6126-3; AD-211 690.
Order from LC mi$1.80, ph$1.80 PB 146 279

This report covers an investigation of the effect of vacuum forming sheets of polyvinyl chloride in accordance with a pattern reported to have no axes of weaknesses. An aluminum mold was used to vacuum form the sheets. Specimens were cut and tested in bending at angles of 30, 60, 90, 120, and 150 degrees to an arbitrarily chosen axis. Combinations of two sheets were tested to determine if an increase in rigidity could be obtained. These included bonding together of two sheets with no special attempt at alignment, and bonding together of two sheets with an alignment of the pattern. It is concluded that the effect of embossing the sheet with the pattern resulted in a sheet with no axis of weakness and a great increase in rigidity.

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
EPOXY RESINS FOR USE ON CIVIL WORKS PROJECTS, by Leonard Pepper. Summary of data available as of 1 Mar 59. Aug 59, 55p. 39 refs. Technical rept. no. 6-521, rept. 1.
Order from LC mi$3.60, ph$9.30 PB 148 089

This report reviews the available literature and manufacturers' publications to determine the potential uses of epoxy resins on Civil Works projects. These possible uses fall into three general categories: adhesives, fillers, and coatings. Specific applications that have proved successful include: (a) bonding hardened concrete to hardened concrete; (b) bonding freshly mixed concrete to hardened concrete; (c) sealing cracks in concrete; (d) filling voids, pop-outs, and spalls in concrete; (e) refacing worn concrete or steel surfaces; (f) coating concrete or other surfaces for resistance to chemical attack; (g) protecting electrical components; and (h) bonding attached or embedded items such as dowels, reflector buttons, traffic bars, etc., to concrete. It is recommended that investigations of epoxy-resin systems be continued to: (1) define the uses that are most economically attractive; (2) develop specific performance specifications applicable to such uses; and (3) develop application procedures and information on performance in service. (Author)

Emerson and Cuming, Inc., Canton, Mass.
DEVELOPMENT OF INORGANIC FOAM MATERIAL OF CONTROLLED DIELECTRIC PROPERTIES FOR HIGH TEMPERATURE SERVICE. Final rept. 5 Nov 56-15 Dec 58 on Contract NOas-57-357-c. 18 Dec 58, 26p. AD-211 222.
Order from LC mi$2.70, ph$4.80 PB 146 291

A low density (18 to 30 lbs. per cubic foot) fine grained structural material capable of withstanding 900°F has been developed by autogenous bonding of tiny glass bubbles. Research on bonding techniques including silicone resin bonds, as well as the autogenous bond is described.) This structural material has been modified by additions of aluminum flake or titanium dioxide powder to give controlled dielectric constant structures having relatively low dielectric loss. Increase in service temperature range of these materials by 500 to 1000°F is believed possible by chemical modification of the Eccosphere glass composition.

National Research Labs., Ottawa (Canada).
A TECHNIQUE FOR PRODUCING GLASS-REINFORCED FOAM-FILLED PLASTIC MODEL PROPELLER BLADES, by A. J. Bowker and L. A. J. Pelland. Jan 60, 31p. 12 refs. Aeronautical rept. LR-273.
Order from LC mi$3.00, ph$6.30 PB 147 734

A procedure for making foam-filled glass-reinforced model plastic propeller blades is described in some detail, and the resulting blade is compared with similar blades of wood and aluminum. The plastic blade compares favourably to wood and aluminum in all respects except strength, where aluminum proves more advantageous. Also, extremely thin blades might be difficult to fabricate accurately in plastic. It would appear, with regard to strength, rigidity, duplicability, dimensional accuracy and stability, that the wood is always inferior and that the expense involved in reproducing aluminum blades is warranted only when excessive stresses or very thin sections are involved. (Author)

Springfield Armory, Mass.
INVESTIGATION OF HIGH DENSITY RIGID FOAMS, by K. A. Jorczak. Rept. on Research of Materials for High Temperature Uses. 20 Nov 59, 10p. SA-TR18-1068.
Order from LC mi$1.80, ph$1.80 PB 146 944

An investigation was conducted to obtain data to ascertain whether urethane foam materials (20 lb/cu ft)

can be increased to higher densities and to determine the practicality of using fiber glass as a filler. Results indicate that rigid urethane foams of a density greater than 20 lb/cu ft can be molded and that fiber glass filler does not influence significantly the physical properties of the foams. Test procedures are given, and results discussed. (Author)

Rubber and Elastomers

Naval Ordnance Lab., White Oak, Md.
DEVELOPMENT OF AN OZONE RESISTANT SYNTHETIC RUBBER COMPOUND FOR LOW TEMPERATURE SERVICE, by Doris V. Steele and H. E. Mathews, Jr. 4 Dec 58, 25p. 6 refs. NAVORD rept. 6241; AD-214 482.
Order from LC mi$2.70, ph$4.80 PB 146 289

A program to develop rubber diaphragms for the Hydrostatic Switch XH-46C was carried out. Various formulations based on a styrene-butadiene polymer were compounded and evaluated for low temperature flexibility, aging, and ozone resistance under outdoor and accelerated laboratory environmental conditioning.

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF METHOD FOR DETERMINING RESISTANCE OF RUBBER TO ABRASION BY SAND-BLAST, by J. Oser. 11 May 59, 14p. 4 refs. Rept. no. 31-5; AD-215 666.
Order from LC mi$2.40, ph$3.30 PB 146 283

An apparatus and a method were developed for quantitative evaluation of the relative abrasion resistance of vulcanizates to sandblast. A Hevea gum vulcanizate, and two Hevea vulcanizates containing 40 and 50 parts, respectively, of carbon blacks were tested by means of the apparatus. The gum vulcanizate exhibited a higher abrasion resistance than the two black-loaded vulcanizates. The abrasion resistances of all of the vulcanizates decreased as the impact angle of the abrasive was reduced.

Trionics Corp., Madison, Wis.
HEAT RESISTANT-ELASTOMERIC MATERIAL COMBINATIONS AND FORMS, by Robert E. Stapleton and James Pappis. Final rept. on Contract NOas-58-437-c. 30 Jan 59, 44p. 167 refs. AD-229 209.
Order from OTS $1.25 PB 161 813

Plasticizing of glass: A glass composition of 23.8% arsenic, 42.8% thallium and 33.4% sulfur, by weight, was prepared. A very plastic product was formed upon rapid or slow cooling of a heated composition of 60% sulfur and 40% glass. Centrifuging the product resulted in a brittle glass phase and a plastic sulfur phase. Irradiation polymerization of inorganic polymers: Phosphonitrilic chloride was prepared by the reaction of tetrachloroethane with phosphorus pentachloride and the polymerization of the resultant mixture of trimer and tetramer compounds by heat treatment. Phosphonitrilic chloride was very elastic below 300°C but gradually lost its elasticity and decomposed above this temperature. Ductile silver compounds: Rods and sheets of silver chloride were slowly bent through an angle of 90° without breaking. The ductility of the silver chloride appeared to decrease with time when the cast and pressed specimens were exposed to light after forming.

MATHEMATICS

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ALTERNATIVE SEQUENCES OF SAMPLING RATES FOR TIGHTENED MULTILEVEL CONTINUOUS SAMPLING PLANS, by Donald Guthrie and M. V. Johns, Jr. Technical rept. no. 36 on Contract N6onr-25126. 18 Feb 58, 29p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 138 268

The purpose of this report is to propose a new scheme for selecting the sequence of levels to be used in tightened multi-level continuous sampling plans of the type MLP-T given by Derman, Littauer, and Solomon (Annals of Mathematical Statistics, 28(1957)395-404). Certain advantages of the new levels are exhibited when k , the number of levels, is infinite and a criterion for comparison of the two schemes is proposed for the case of finite k . In addition, AOQ and AFI functions are given and contours of constant AOQL are plotted for the two schemes.

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON SCHLICHT TRANSFORMATIONS BY FUNCTIONS OF TWO COMPLEX VARIABLES, by Zygmunt Charzynski. Rept. on National Science Foundation Grants 3661 and 10375. 4 May 60, 23p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 147 354

Brown U., Providence, R. I.
EXTENSIONS TO THEORY OF TIME SERIES ANALYSIS, by W. Freiberger. Quarterly rept. no. 5, 1 Aug-31 Oct 59, on Contract DA 36-039-sc-78130. [1959] 11p. 3 refs. AD-233 473.
Order from LC mi$2.40, ph$3.30 PB 147 414

The present study has concentrated on the case of a stochastic process where the sample values are uncorrelated (i.e., $Ex_\nu x_\mu = \sigma_{\nu\mu}$), with a flat spectral density. This would correspond either to white noise or to bandlimited noise with a correlation function $(\sin \pi t)/\pi t$, sampled at the zeros (i.e., $t = 1, 2, \ldots$).

Bureau of [Naval Weapons] Washington, D. C.
TABLE OF CIRCUMFERENCES AND AREAS. 21 Mar 47, 103p. NAVORD OD. 5797.
Order from LC mi$5.70, ph$16.80 PB 148 651

The computations are based on the value of π to eight significant figures, with a partial adjustment for the rounding error in π. The tabulated values of the Circumference and Area are in error by at most one unit in the last place. (Author)

California U. [Berkeley].
SYSTEMS OF DIFFERENTIAL FORMS, INCLUDING KURANISHI'S THEORY OF TOTAL PROLONGATIONS, by Harold H. Johnson. Technical rept. no. 2 on Contract DA 04-200-ORD-456. [1953] 84p. 6 refs. OOR rept. no. 1503.2; AD-138 694.
Order from LC mi$4.80, ph$13.80 PB 147 859

E. Cartan's theory of differential forms and their integral manifolds is outlined. Systems of differential forms are studied on a real analytic n-dimensional abstract manifold V. All the results are local so an assumption is made that V is a ball in Euclidean n-space. The fundamental concepts, which include contact elements, systems of differential forms, polar equations, independent variables, and prolongations, are explained. The Cartan-Kähler theorem and the Cauchy-Kowalewski theorem, and the systems in involution are discussed. An exposition of Kuranishi's theory of prolongation is presented in detail.

Carnegie Inst. of Tech., Pittsburgh, Pa.
AN EXTENSION OF THE CONCEPT OF THE MINIMUM IN CALCULUS, AND THE CALCULUS OF VARIATIONS, by A. Bomberault and E. Saibel. Technical rept. no 9 on Contract DA 36-061-ORD-495. [1952] 28p. 8 refs. CIT-ORD-15A-TR7; OOR rept. no. 1156.11; AD-155 100.
Order from LC mi$2.70, ph$4.80 PB 147 864

Analogs to the minimum problem of the calculus and calculus of variations are stated which may have use in describing interacting physical systems. The authors obtain necessary conditions that such generalized minima, which are called "polyminima", exist. Existence theorems which depend strongly upon fixed point theorems are also proved. Approximation methods corresponding to Rayleigh Ritz and finite difference methods are suggested. Plans are being made to give an application of the theory developed here to a physical problem. (Author)

Chicago U., Ill.
INVESTIGATIONS IN ABSTRACT ANALYSIS, by Irving E. Segal. Final rept. on Contract N6ori-02053. [1959] 4p. 13 refs. AD-225 006.
Order from LC mi$1.80, ph$1.80 PB 147 700

The project has been generally oriented towards the mathematical formulation of quantum field and elementary particle theory, and related purely mathematical questions in operator theory, harmonic analysis, and the theory of functional integration.

Chicago U., Ill.
SEMI-SIMILARITY INVARIANTS FOR SPECTRAL OPERATORS ON HILBERT SPACE, by Alvin N. Feldzamen. Technical note no. 1 on Contract AF 49(638)693. May 60, 78p. 34 refs. AFOSR TN-60-506.
Order from LC mi$4.50, ph$12.30 PB 148 091

This report presents in detail the beginnings of an equivalence theory for operators on Hilbert and Banach spaces patterned after a complete finite-dimensional theory.

[Columbia U., New York.]
A CLASS OF SMOOTH BUNDLES OVER A MANIFOLD, by James Eells, Jr. [Rept. on Contract Nonr-266(57).] [1959] 22p. 10 refs.
Order from LC mi$2.70, ph$4.80 PB 147 702

This paper illustrates certain constructions of importance in the geometry of smooth manifolds. It is proved that a homogeneous space B of a connected Lie group G can always be represented as a homogeneous space of a contractible Lie group E, necessarily of infinite demension in general. An examination is made of relations between the Lie algebra of G and that of E (this latter being a Banach-Lie algebra), in case G is compact and semi-simple.

Columbia U., New York.
THE CONTENT OF A DAM AS THE SUPREMUM OF AN INFINITELY DIVISIBLE PROCESS, by J. Gani and R. Pyke. Rept. on Contract Nonr-266(59). [1959] 23p. 16 refs. CU-7-59-Nonr-266(59)MS; AD-219 929.
Order from LC mi$2.70, ph$4.80 PB 147 693

The relation is discussed between the content of a dam and the supremum of a certain infinitely divisible process. The fact is pointed out that the distribution functions of the supremum over time $0 \leq t \leq T$ of a Poisson process with shift, and the content at time T of a dam with Poisson inputs and a constant release rate have identical forms. The backward Kolmogorov equation of the first process is shown to be identical with the forward equation of the second. A closer relation between the 2 processes is proved to exist, and a new definition for dam processes in discrete time is given. This is generalized to dam processes in continuous time whose net inputs are from a wide class of infinitely divisible processes. The distribution function of the total time during which such dams are empty and non-empty is found. A simplification of the double Laplace transform is obtained for the distribution function of the supremum over $0 \leq t \leq T$ of certain infinitely divisible processes with positive jumps. (Author)

Cornell U., Ithaca, N. Y.
A MINIMAX TEST OF FIT, by Lionel Weiss. Rept. on Contract [Nonr-266(04)]. [1959] 15p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 146 050

Two things are noted, first, limiting attention to the class of density functions which consist of horizontal line segments is not too great a restriction, since any density function satisfying mild regularity conditions can be arbitrarily closely approximated by a density function in our class. Second, our definition of distance is a rather peculiar one. Its purpose is to guarantee that the alternatives to the hypothesis differ from the uniform density function over a long enough interval to give us some chance of detecting the difference.

Georgia U., Athens.
CENTRALLY TRUNCATED SAMPLES FROM A NORMAL DISTRIBUTION, by A. Clifford Cohen, Jr. Final rept. for 1 Oct 52-31 Dec 58 on Estimation from Restricted Samples, Contracts DA 01-009-

ORD-288 and DA 01-009-ORD-463. 15 Jan 59, 12p. 18 refs. AD 212 023.
Order from LC mi$2.40, ph$3.30 PB 147 871

An investigation is presented concerning the maximum likelihood estimation of the mean μ and the standard deviation σ of a complete normal distribution for which the probability density function is $f(x) = (\sigma\sqrt{2\pi})^{-1} \exp -(x-\mu)^2/2\sigma^2$, $-\infty \quad x \infty$, when samples are centrally truncated (when they are selected only from the remainder of the distribution after removal of the center section). Estimators are derived using the procedures of singly and doubly truncated samples.

Hebrew U. (Israel).
THE PRODUCT OF SUMMABILITY METHODS: NEW CLASSES OF TRANSFORMATIONS AND THEIR PROPERTIES, by Amnon Jakimovski. Technical Scientific note [no. 2, pt. 2] on Contract AF 61(052)187. Aug 59, 77p. 20 refs. AFOSR-TN-59-816; AD-232 071. AD-232 071.
Order from LC mi$4.50, ph$12.30 PB 146 101

Two new classes of transformation, which might be looked upon, respectively, as the sequence-to-function analogues to the generalized (and quasi-) Hausdorff transformations are defined and investigated. (Author)

Institute for Advanced Study, Princeton, N. J.
A MEASURE OF ASYMMETRY FOR CONVEX SURFACES, by E. Asplund, G. Bredon and B. Grünbaum. Rept. on Contract AF 49(638)253. Apr 60, 4p. 2 refs. AFOSR-TN-60-403.
Order from LC mi$1.80, ph$1.80 PB 147 518

Generalizing results of G. v. Sz. Nagy it is proved that the surface centroid of any convex body K in E^n, $n \geq 2$, divides the distance between any pair of parallel supporting hyperplanes of K in ratio less than 2n-1, this being the best possible bound. (Author)

Institute for Advanced Study, Princeton, N. J.
ON A MEASURE OF ASYMMETRY OF CONVEX BODIES, by E. Asplund E. Grosswald, and B. Grünbaum. Rept. on Contract AF 49(638)253. Mar 60, 7p. 9 refs. AFOSR-TN-60-359.
Order from LC mi$1.80, ph$1.80 PB 147 516

A new measure of asymmetry of convex bodies in Euclidean spaces is defined and some of its properties established. As far as is known, this is the first measure according to which the n-dimensional simplex is not the most asymmetric n-dimensional convex body for $n \geq 3$. (Author)

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
EXTENSIONS OF THE LAPLACE CASCADE METHOD, by John Hilary Billings. Rept. on Contract AF 49(638)228. Apr 60, 133p. 40 refs. Technical note BN-209; AFOSR-TN-60-503.
Order from LC mi$6.90, ph$21.30 PB 147 525

The Laplace cascade method for hyperbolic equations $u_{xy} + a(x,y)\, u_x\, b(x,y)\, u_y + c(x,y)\, u = 0$ is extended to systems of second order hyperbolic equations.

Institute of Mathematical Sciences, New York U., N. Y.
A SPECIAL HILL'S EQUATION WITH DISCONTINUOUS COEFFICIENTS, by Harry Hochstadt. Rept. on Contract AF 49(638)229. Mar 60, 19p. 5 refs. Research rept. no. BR-32; AFOSR-TN-60-322.
Order from LC mi$2.40, ph$3.30 PB 147 560

The equation
$y'' + \lambda^2 \rho(x) y = 0$
$\rho(x) = 1 \qquad |x| \leq 1$
$= a^2 \qquad 1 < |x| < L$
is investigated. $\rho(x)$ is taken as a periodic function of period 2L and defined as above in the interval (-L, L). The nature of the characteristic values λ for which the equation has solutions of period L and 2L is investigated. Stability charts are drawn showing for which values of a^2 and λ all solutions are bounded, and for which some solutions are not bounded. (Author)

Naval Ordnance Test Station, China Lake, Calif.
ESTIMATES OF VARIANCES AND COVARIANCES OF MEASUREMENTS CORRECTED BY THE PRINCIPLE OF CONDITIONED OBSERVATIONS WITH APPLICATIONS TO DATA REDUCTION PROBLEMS, by Frank Reed. Jan 58, 37p. 5 refs. NOTS 1275; NAVORD rept. 4953; AD-219 427.
Order from LC mi$3.00, ph$6.30 PB 148 044

A method is presented for estimating variances and covariances of measurements that are corrected by the method of conditioned observations. The case where measurements are related by linear functions is discussed first. The theory developed is applied to the general data reduction problem. (Author)

Naval Ordnance Test Station, China Lake, Calif.
FIRST AID FOR PET PROJECTS INJURED IN THE LAB OR ON THE RANGE, OR, WHAT TO DO UNTIL THE STATISTICIAN COMES, by R. M McClung. 29 Jan 52, 59p. 11 refs. Technical memo. 1113.
Order from LC mi$3.60, ph$9.30 PB 148 051

The concept of confidence, the use and computation of confidence and tolerance limits, and a method for determining the significance of the difference in two or more sample means are discussed in an elementary manner. (Author)

Naval Research Lab., Washington, D. C.
A TABLE OF PROBABILITY DISTRIBUTIONS USEFUL IN WAR GAMES AND OTHER COMPETITIVE SITUATIONS, by H. L. Toothman. Final rept. 16 May 60, 92p. 1 ref. NRL rept. no. 5480.
Order from LC mi$5.40, ph$15.30 PB 145 721

A formula for a probability distribution has been computed and tabulated by a digital computer in terms of its four arguments. The formula gives the probability

of t successes, if each of m players making r successive plays has probability p_1 of success in each play, and probability of p_2 of being eliminated from subsequent play. The argument p_1 ranges from .01 to .95, p_2 ranges from .00 to .90, and m and r range from 1 to 4. The competitive situation can also be described in terms of a random walk on three points with two absorbing barriers.

North Carolina U., Chapel Hill.
ON STOCHASTIC MATRICES WITH A NON-TRIVIAL GREATEST POSITIVE ROOT, by Alfred Brauer. UNC Technical rept. no. 12 on Contract AF 18(603)38. Nov 59, 9p. 9 refs. AFOSR-TN-59-933.
Order from LC mi$1.80, ph$1.80 PB 148 024

The greatest positive characteristic root of an unreduced stochastic matrix A is the trivial root 1. In this paper such matrices A are considered which have a non-trivial greatest positive root which is less than the trivial root 1, but greater than or equal to the absolute value of all the other characteristic roots. (Author)

Purdue U. [Lafayette, Ind.]
NORMAL OPERATORS ON THE BANACH SPACE $L^p(-\infty,\infty)$. PART I. BOUNDED TRANSFORMATIONS, by G. L. Krabbe. Technical note no. 3 on Contract AF 49(638)505. 20 Nov 59, 23p. 12 refs. AFOSR TN-59-1115.
Order from LC mi$2.70, ph$4.80 PB 146 385

Purdue U. [Lafayette, Ind.]
NORMAL OPERATORS ON THE BANACH SPACE $L^p(-\infty,\infty)$. PART II. UNBOUNDED TRANSFORMATIONS, by G. L. Krabbe. Technical note no. 4 on Contract AF 49(638)505. 20 Nov 59, 8p. 5 refs. AFOSR TN-59-1116; AD-232 460.
Order from LC mi$1.80, ph$1.80 PB 146 384

RIAS, Baltimore, Md.
AUTOSYNARTETIC SOLUTIONS OF DIFFERENTIAL EQUATIONS, by D. C. Lewis. Rept. on Contract AF 49(638)382. May 60, 64p. 5 refs. Technical rept. 60-12; AFOSR-TN-60-438.
Order from LC mi$3.90, ph$10.80 PB 148 014

Rice Inst., Houston, Tex.
A NUMERICAL METHOD FOR THE SOLUTION OF A PARABOLIC SYSTEM, by Jim Douglas, Jr. Rept. on Contract AF 49(638)632. 9 Feb 60, 16p. 10 refs. AFOSR-TN-59-1121; AD-232 551.
Order from LC mi$2.40, ph$3.30 PB 146 383

A numerical method for approximating the solution of a nonlinear parabolic system is presented. An iterative method for treating the algebraic equations arising at each time step is discussed. (Author)

University Coll., Cork (Eire).
THE ABSOLUTE CONVERGENCE OF CERTAIN LACUNARY FOURIER SERIES, by Siobhan O'Shea. Technical note no. 6 on Contract AF 61(514)1399. [1956] 13p. 2 refs. AFOSR-TN-59-883; AD-226 388.
Order from LC mi$2.40, ph$3.30 PB 146 100

Let f(x) be measureable and periodic with period 2π, and satisfy a uniform Lipschitz condition of order $\alpha(0<\alpha\leq 1)$ in every finite interval. Let the Fourier series of f be $\frac{1}{2}a_0 + \sum_1^\infty (a_n \cos nx + b_n \sin nx)$. Results for the cases $0<\alpha\leq\frac{1}{2}$ are interpolated between the following 2 theorems: (1) if $\alpha>\frac{1}{2}$, then $\sum (|a_n|+|b_n|)<\infty$; and (2) if $\alpha=0$ and $a_n=b_n=0$ except possibly for $n=n_k$, where $\{n_k\}$ is a sequence of positive integers satisfying $\liminf_{k\to\infty} \frac{n_{k+1}}{n_k}>1$, then $\sum (|a_n|+|b_n|)<\infty$ is true.

Virginia Agricultural Experiment Station, Blacksburg.
TWO-WAY RANK-SUM TESTS FOR DISPERSIONS, by A. R. Ansari and R. A. Bradley. Technical rept. no. 9 on Development of Statistical Methods for Experimental Designs in Quality Control and Surveillance Testing, Contract Nonr-2352(01). Aug 59, 31p. 14 refs. AD-225 593.
Order from LC mi$3.00, ph$6.30 PB 148 190

Non-parametric 2-sample tests are investigated on dispersions. X- and Y-samples of m and n independent observations are considered from population with continuous cumulative distribution functions F(u) and G(u). For the basic test, the difference in locations of the 2 populations are known and the 2 samples are adjusted to have equal locations. Taking these location parameters to be zero, the hypothesis $G(u)\equiv F(u)$ is tested against alternative of the form $G(u)\equiv F(\Theta u)$, where $\Theta\neq 1$. The 2 samples are ordered in a single joint array, and ranks are assigned from each end of the joint array towards the middle. The statistic used is W, the sum of ranks for the X-sample. The distribution of W is studied, the first 4 moments of W are developed, a normal approximation to the null distribution of W is devised, and large-sample properties of the W-test are considered. Other non-parametric tests of dispersions are reviewed. A modified test is suggested where the difference in population locations is not known. Its properties are investigated for a limited sampling study. The study indicates there is no great difference in the moments of W for either test.

[Washington U., Seattle]
EXPLICIT PERTURBATION FORMULAE AND CONVERGENCE THEOREMS, by F. H. Brownell. [Rept. on Contract Nonr-477(20)]. [1958] 28p. 4 refs. AD-214 098.
Order from LC mi$2.70, ph$4.80 PB 146 295

Perturbation theory is developed for a λ in the point spectrum with finite multiplicity m of a Banach or Hilbert space linear operator by giving explicit formulas for the eigenvalue and the eigenvector series covering all possible splitting cases. The convergence of these series is proved by using majorants, and error estimates are given under suitable boundedness assumptions for a few special splitting cases. These arguments can be carried over to any given splitting case. An example is given of a nonisolated λ_0 for which the boundedness and other assumptions hold.

[Washington U., Seattle].
A NOTE ON KATO'S UNIQUENESS CRITERION FOR SCHRODINGER OPERATOR SELF-ADJOINT EXTENSIONS, by F. H. Brownell. [Rept. on Contract Nonr-477(20)]. [1951] 28p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 146 296

Wayne State U., Detroit, Mich.
ON AXIOMATIC APPROACH TO HOMOLOGY THEORY WITHOUT USING THE RELATIVE GROUPS, by Sze-Tsen Hu. Technical note no. 8 on Contract AF 49(638)179. Apr 60, 18p. 5 refs. AFOSR-TN-60-371.
Order from LC mi$2.40, ph$3.30 PB 148 023

Recently, D. Puppe proposed a new axiomatic approach to homology theory without using the relative groups. Since he used a base point in each space throughout his approach, he can prove the uniqueness theorem only for connected CW-complexes. In the present note, Puppe's axiomatic approach is improved by removing the base point. After the base point has been removed from the theory, it turns out that the uniqueness theorem can be proved for all CW-complexes. (Author)

Wisconsin U., Madison.
ALGEBRAS OF LINEAR TRANSFORMATIONS, by R. Creighton Buck. Technical rept. no. 4 on Representation and Characterization Problems for Analytic Functions, Contract DA 11-022-ORD-1851. Nov 56, 20p. 6 refs. OOR rept. 1406.4M.
Order from LC mi$2.40, ph$3.30 PB 138 139

One definition of harmonic analysis is that it is the study of a group in terms of the function spaces defined on it. In the present paper, he shall describe a general approach which is based upon a shift in the point of view, accompanied by an elaboration of the underlying structure.

Wisconsin U., Madison.
FUNCTIONS OF RESTRICTED VARIATION, by Preston G. Hammer. Technical rept. no. 8 on Studies in Numerical Analysis, Contract DA 11-022-ORD-2301. Mar 58, 26p. 15 refs. OOR rept. no. 1626.9; AD-137 081.
Order from LC mi$2.70, ph$4.80 PB 147 870

A detailed analysis is made of the oscillations or real-valued functions defined on a simply ordered set. A new class of functions, those of restricted variation, is singled out which include the class of functions of bounded variation. The concept of a function of restricted variation is a generalization of the concept of a Cauchy sequence. The concept of the k-variations of functions is introduced. This concept is derived from the restriction of the number of points in a partition to a most k and is essential to the definition of the restrictedness of variation. The syntonicity of function pairs is defined in order to obtain necessary and sufficient conditions that the total variation of a sum of two functions is the sum of their total variations. The syntonicity concept is required to obtain the full converse to the theorem giving the usual decomposition of a function of bounded variation.

Wisconsin U., Madison.
REPRESENTATION AND CHARACTERIZATION PROBLEMS FOR ANALYTIC FUNCTIONS, by R. Creighton Buck. Final rept. on Contract DA 11-022-ORD-1851. July 58, 19p. 11 refs. OOR rept. no. 1406.8; AD-200 195.
Order from LC mi$2.40, ph$3.30 PB 147 867

Expansion theory: Results of a study dealing with a general approach to the expansion of analytic functions in polynomial series are outlined and reported in Ergebnisse der Mathematik no. 19, published by Springer-Verlag in Germany. Transformation algebras: A study was made of the properties of the algebra of real valued functions on a general locally compact space. Studies were also made on the algebra of continuous linear transformations applied to topology. (Portions of this report will not reproduce)

Computing Devices

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A SURVEY OF ENIAC OPERATIONS AND PROBLEMS, 1946 - 1952, by W. Barkley Fritz. Aug 52, 27p. 53 refs. Memo rept. no. 617.
Order from LC mi$2.70, ph$4.80 PB 148 458

The primary interest of the paper is the brief descriptions given of the specific unclassified problems completed during this period. It is hoped that individuals not yet in immediate contact with high speed computers will gain some insight into the type of problems which machines make accessible to computation. Pertinent reference material is given to a variety of unclassified published material related to these completed programs. (Author)

Catholic U. of America, Washington, D. C.
RESEARCH ON HIGH TEMPERATURE FERROELECTRIC STORAGE MEDIA, by Charles F. Pulvari. Rept. on Contract AF 33(616)5736. Apr 60, 123p. 21 refs. WADD Technical rept. 60-146.
Order from OTS $2.75 PB 161 805

Work was conducted to develop a ferroelectric material capable of operating at a temperature possibly as high as 500°C., to investigate the various developed materials and their possible use as a digital computer element capable of operating at high temperatures, and to study switching phenomena and their relationship to crystal structure in order to determine the possibility of a threshold switching field.

David Taylor Model Basin, Washington, D. C.
AUTOMATIC ROUTINES FOR PROGRAMMING MANAGEMENT DATA PROBLEMS ON UNIVAC I AND II, by Rita M. Horbett, Arthur Shapiro and others. Oct 58, 73p. 2 refs. Rept. 1241; AD-206 648.
Order from LC mi$4.50, ph$12.30 PB 147 464

A collection of automatic programming routines is presented. These routines are designed for the Univac, a high-speed, automatic, electronic, digital computer. Routines are included which perform the

functions of edit, sort, merge, and data conversion. A detailed description is given of the capabilities and limitations of the routines, and full directions on how to use them. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
AUTOMATIC ERROR ANALYSIS IN DIGITAL COMPUTATION, by Ramon E. Moore. Technical rept. 28 Jan 59, 64p. LMSD-48421.
Order from LC mi$3.90, ph$10.80 PB 147 669

This technical report introduces a systematic approach to the general subject of digital computation. The objective of the study is to mechanize a complete error analysis for any digital computation. A method for such mechanization is described, by which the digital computer is to deliver error bounds along with every approximation. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
PLASTIC NEURONS AS MEMORY ELEMENTS, by D. G. Willis. Technical rept. June 59, 29p. 14 refs. LMSD-48432-1; AD-219 839; Supersedes LMSD-48432; AD-217 265.
Order from LC mi$2.70, ph$4.80 PB 147 670

A study was conducted that defines precisely a class of plastic neuron models, determines their information storage capacity, and shows the mechanism by which information can be read into and out of a system of such neurons on a random access basis. The neuron model investigated has an arbitrary number n of input leads and one output lead. At any time step the ith input lead will have some synaptic value s_i associated with it, and will be carrying some signal e_i, which is either 1 or 0 (firing or not firing). The neuron will fire and produce a 1 signal on its output lead if, at the previous time step, $\sum_n e_i s_i \geq T$ where T is some threshold value. The synaptic value s_i will increase, decrease, or remain unchanged at each time step depending upon the firing condition of the neuron and the signal just carried by the ith lead. The storage capacity of this neuron model is determined principally by the long term stability of the s values, and for any reasonable number of inputs appears to be compatible with the requirements for human memory. Two demonstrations are presented showing the read-in-read-out properties of a system of 288 plastic neurons simulated on a digital computer. An expression is derived for the output of a plastic neuron as a function of its previous history. (Author)

Office of Naval Research, Washington, D. C.
SYMPOSIUM ON SUPERCONDUCTIVE TECHNIQUES FOR COMPUTING SYSTEMS, WASHINGTON, D. C., MAY 17-19, 1960. Proceedings [1960] 419p. ONR Symposium rept. ACR-50.
Order from OTS $4.50 PB 161 763

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Stanford Electronics Labs., Stanford U., Calif.
DESIGN OF A SAMPLED DATA CONTROLLER USING TRANSISTOR LOGIC, by M. Cavestany. Rept. on Contract Nonr-225(24). 13 Aug 59, 51p. 9 refs. Technical rept. no. 2100-1; AD-225 011.
Order from LC mi$3.60, ph$9.30 PB 147 692

The design and construction of a digital controller for use in the study of sampled-data control systems is discussed. The device is a hybrid computer combining digital and analog techniques to take advantage of the special properties of each. The device was designed to permit the introduction of a digital controller in an analog computer simulation which would be simpler and more flexible to use than is possible with conventional analog or digital components alone. Analog methods are used to produce sums and products, and digital methods are used to store the samples of data. A novel feature of this controller is the use of special modulators to convert the analog voltages to frequency information which is the form in which the data is

stored on a magnetic drum. An exposition of the principles of digital compensation in sampled-data systems is made, and the different steps leading to the conception and utilization of a digital controller are covered. The system is based on the utilization of a magnetic drum as data hold, storage, and delay element, with transistor digital logic circuits to perform the necessary switching. (Author)

Washington U., Seattle. Div. of Counseling and Testing Services.
REGRESSION WEIGHTS BY THE METHOD OF ADJUSTED TOTAL GROUPS: A PROGRAM FOR THE IBM TYPE 650, by Dennis E. Hamilton. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). Aug 59, 14p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 147 698

The rationale of the method (Johnson, 1959a) is summarized, the major difficulty in the procedure is discussed.

MECHANICS

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
ON THE VIBRATION OF THERMALLY STRESSED PLATES IN THE PRE-BUCKLING AND POST-BUCKLING STATES, by Yechiel Shulman. Rept. on Contract Nonr-1841(22). Jan 58, 53p. 8 refs. Technical rept. 25-25.
Order from LC mi$3.60, ph$9.30 PB 138 252

The free vibration characteristics of thermally stressed plates have been obtained in the pre-buckling and post-buckling states. The results are valid for uniformly heated plates with two opposite edges simply supported and with generalized support conditions on the other two edges. A numerical example has been worked out.

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
RESEARCH PROGRAM ON STRUCTURAL DYNAMICS AND THERMO ELASTICITY PROBLEMS, by T. H. H. Pian. Summary rept. on Contract Nonr-1841(22). Jan 58, 18p. 31 refs. Technical rept. 25-27.
Order from LC mi$2.40, ph$3.30 PB 138 251

The initial phase of the program consisted only of problems related to responses of structures to shock and impact. Since September 1952, the problem of transient stresses due to aerodynamic heating was added to the research program. During the last year the field of study has been limited only to problems related to structure under thermal environment.

American Machine and Foundry Co., Alexandria, Va.
ULTRA-SHORT-TIME CREEP RUPTURE EQUIPMENT MANUAL, by Joseph S. Ives, Jr. Rept. for 1 Mar 58-31 Mar 59 on Materials Applications, Contract AF 33(616)5557. Apr 60, 52p. WADC Technical rept. 59-762, Pt. I.
Order from OTS $1.50 PB 161 789

The purpose of this program was to develop a method of heating a sample of sheet metal to a pre-determined temperature in a short period of time and to measure the creep characteristics of this material at the developed temperature. Described in this report are the special equipments designed to carry out the work together with the necessary operating instructions. Also included are the drawings required to produce the equipment at the contractor's facilities. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE LOAD-CARRYING CAPACITY OF WIDE BEAMS AT FINITE DEFLECTIONS, by R. M. Haythornthwaite and W. E. Boyce. Technical rept. no. 32 on Contract Nonr-562(10). Feb 58, 30p. 10 refs. C11-32.
Order from LC mi$2.70, ph$4.80 PB 138 131

Estimates of the post-yield carrying capacity of laterally loaded plates may be obtained conveniently from the velocity fields associated with either the limit load or the membrane solution. The latter can be used even when the limit load is not known. As an illustration, an approximate membrane solution is found for a centrally loaded rectangular plate, rigidly clamped along two opposite sides and free along the other two. The velocity field includes both a local circular symmetric deformation near the load and also a general beam bending mechanism. The rate of deflection is computed and the field is also used to obtain an upper bound to the limit load. Comparison is made with the results of tests of six steel beams of various widths. (Author)

Illinois Inst. of Tech., Chicago.
PLASTIC ANALYSIS OF CIRCULAR CONICAL SHELLS, by Philip G. Hodge, Jr. Rept. on Contract Nonr-1406(04). Aug 59, 25p. 6 refs. DOMIIT rept. no. 1-8.
Order from LC mi$2.70, ph$4.80 PB 147 724

A right circular conical shell of edge angle α is subjected to a concentrated load Q directed along the axis. The collapse load is found to be $Q = 2\pi M_0 \cos^2 \alpha$, independently of the size or support conditions of the shell. Some solutions are also obtained for the case where the load is distributed over a finite area. Bounds are found on the collapse load of a general rotationally symmetric shell under a concentrated load. (Author)

Israel Inst. of Tech., Haifa.
BUCKLING OF CONICAL SHELLS UNDER EXTERNAL PRESSURE AND THERMAL STRESSES, by Nicholas J. Hoff (Stanford U.) and Josef Singer. Technical final rept. on Contract AF 61(052)123. Dec 59, 83p. 21 refs. AFOSR-TR-59-203.
Order from LC mi$4.80, ph$13.80 PB 147 497

Simplified differential equations governing the deformations of deep thin circular conical shells subjected to arbitrary loads and arbitrary temperature distributions are derived by the principle of the minimum total potential energy. The equations reduce to Donnell's equations (extended to include an arbitrary

temperature distribution) when the cone angle approaches zero. An asymptotic solution of these simplified equations is obtained for a truncated conical shell subjected to an axisymmetrical temperature distribution. The equations are extended to include problems of elastic stability.

Lockheed Aircraft Corp., Sunnyvale, Calif.
BUCKLING OF A CYLINDRICAL SHELL SUBJECTED TO A SADDLE-TYPE LOAD, by B. O. Almroth. Apr 60, 37p. LMSD-288 242.
Order from LC mi$3.00, ph$6.30 PB 148 078

This report presents a buckling analysis for a circular cylindrical shell subjected to external lateral pressure over a portion of the cylinder length. The results are useful for determining allowable loads in motor cases and other thin-walled structures during handling and storage. The method uses a stability criterion based on the principle of minimum potential energy. The Rayleigh-Ritz procedure is used to expand the displacement components in trigonometric series.

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
CYLINDRICAL SANDWICH CONSTRUCTION DESIGN, by Sidney Allinikov. Rept. on Materials Application. Feb 60, 277p. 14 refs. WADD Technical rept. 60-133.
Order from OTS $4.00 PB 161 793

This report is a compilation of papers which present a comprehensive treatment of the theories and parameters associated with the design of cylindrical sandwich constructions. Many of the formulas developed are applicable to a wide variety of core and facing combinations. Experimental data on flat and curved sandwich sections are furnished to support the theoretical solutions related to the design of these structures. (Author)

Naval Research Lab., Washington, D. C.
EXPERIMENTAL MEASUREMENT OF MECHANICAL IMPEDANCE, by J. W. Young, Jr. and R. O. Belsheim. 24 May 60, 25p. 9 refs. NRL rept. 5458.
Order from LC mi$2.70, ph$4.80 PB 144 639

A mechanical impedance head and measuring system for experimentally determining mechanical impedance are described, following a brief review of the basic concepts. The system incorporates commercially available equipment for excitation, observation, and analysis of measurements. In order to check the measuring techniques, and to gain experience in the use of the equipment, solid blocks as well as a realistic structure were tested. The results for the various size blocks and for the structure were compared with the expected theoretical results. It is concluded that the system could be used to measure mechanical impedance over a frequency range of 10 to 500 cps. A flaw in the present system is that point-by-point measurements are required, whereas continuous measurements over the frequency range are essential for extensive measurements. The necessary revisions are feasible. (Author)

Stanford Research Inst., Stanford U., Calif.
ATTENUATION OF THE SHOCK WAVE PRODUCED IN A SOLID BY A FLYING PLATE, by G. R. Fowles. Rept. on Contract AF 49(638)625. 20 Aug 59, 30p. 11 refs. SRI Project GU-2912; AFOSR-TN-59-1281.
Order from LC mi$2.70, ph$4.80 PB 147 684

The attenuation of the plane shock wave produced in a solid by a flying plate of the same material is treated neglecting dissipative processes and effects of material rigidity. Explicit formulas for the position of the shock front and the shape of the pulse as functions of time are obtained by application of Friedrich's method. A numerical example for an aluminum target and projectile is presented to illustrate some of the features of the calculation, and an experiment is proposed to test the theory. The experiment should also allow a reasonably precise measurement of sound velocity immediately behind the shock front to be obtained. This possibility applies equally well to the case of target and projectile of different materials. (Author)

Watertown Arsenal Labs., Mass.
A CONCEPT OF FATIGUE DAMAGE, by Joseph I. Bluhm. June 58, 20p. 24 refs. WAL Technical rept. 893/202; AD-162 567.
Order from LC mi$2.40, ph$3.30 PB 148 053

The behavior of a simple conventional model of material subjected to fatigue is described and qualitatively related to the magnitude of loads. This is shown to lead to a quantitative damage concept for fatigue based upon the absolute strain in excess of the current endurance limit. This is distinct from previous suggestions for damage based upon the plastic strain. The latter criterion is shown to fail for the low stress level at which plastic flow is known to occur. (Author)

Watertown Arsenal Labs., Mass.
STRESS ANALYSIS OF A THIN STRIP CONTAINING A LARGE HOLE, by E. W. Ross, Jr. Apr 60, 52p. 3 refs. Technical rept. WAL TR 811.8/1.
Order from LC mi$3.60, ph$9.30 PB 146 163

This report treats the problem of finding the elastic strain and stress distribution around a hole in a thin strip under uniaxial tension. The hole is assumed to have two axes of symmetry, parallel and perpendicular to the direction of the applied force, and to be centrally located. In particular, a method is given for finding the limiting stress and strain distribution near the minimum sections (and so the maximum stress-concentration factors) as the hole width approaches the strip width. (Author)

Aerodynamics and Pneumatics

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
SIMILARITY LAWS REQUIRED FOR EXPERIMENTAL AEROTHERMOELASTIC STUDIES, by John M. Calligeros and John Dugundji. Rept. on Contract Nonr-1841(46). May 59, 82p. 28 refs. Technical rept. 75-1; AD-219 760.
Order from LC mi$4.80, ph$13.80 PB 146 102

The similarity laws for the study of aeroelastic phenomena in the presence of aerodynamic heating are derived. The parameters for the general aerothermoelastic problem are obtained by nondimensionalizing the governing equations relating to the external aerodynamic flow, heat conduction to the interior of the structure, and the thermal stresses and external loads applied to the structure. The investigation is limited to moderate temperatures (below about 1000°F-i.e., M<3.5) and considers only elastic behavior of the material. Certain conflicts inherent in the general problem permit similarity only for length-scale ratios of 1. The primary conflict is found to be between the free stream Reynolds number Re, Mach number M, and the basic aeroelastic parameter $\bar{p}_\infty/E_0$. Three methods of dealing with this basic conflict are presented, and in each case the importance of the similarity parameters is discussed. (Author)

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
TABLES RELATED TO AXIAL SYMMETRIC TRANSONIC FLOW PATTERNS, by Gertrude Blanch, Karl Gottfried Guderley, and Emma Marian Valentine. Rept. on Mathematical Techniques of Aeromechanics. Apr 60, 156p. 4 refs. WADC Technical rept. 59-710.
Order from OTS $3.00 PB 161 803

The functions tabulated in this report occur in the theory of axial symmetric flow patterns and Mach numbers equal to and close to one. For the convenience of the reader a summary of the theory is given in Section 1. Subsequent sections give details of the theory and the method of computation. (Author)

Arnold Engineering Development Center [Tullahoma, Tenn.]
AN INVESTIGATION OF THE MODEL BLOCKAGE FOR WIND TUNNELS AT MACH NUMBERS 1.5 TO 19.5, by C. J. Schueler. Rept. on ARO, Inc., Contract AF 40(600)800. Feb 60, 19p. 5 refs. AEDC-TN-59-165; AD-232 492.
Order from LC mi$2.40, ph$3.30 PB 146 115

An experimental investigation of the test section flow blockage characteristics was conducted in the 12- x 12-in. supersonic wind tunnel. The purpose of the tests was to determine whether a method of predicting the maximum size model which will permit the establishment of supersonic flow, based on the model frontal area and bow shockwave strength, is applicable over a wide range of Mach numbers. The tests were conducted over the Mach number range from 1.5 to 5 using test models consisting of 15°, 20°, and 28° half-angle cones, cone-cylinder combinations, and a series of discs. The inadequacy of the one dimensional, normal shock theory for predicting allowable model sizes was reconfirmed. A correlation based on shock wave strength and model frontal area was found to be suitable only over a limited range of Mach numbers. Permissible hemisphere-cylinder model sizes from several wind tunnels covering the Mach number range from 1.5 to 19.5 are also presented. (Author)

Arnold Engineering Development Center, Tullahoma, Tenn.
ON BASE PRESSURES AT HIGH REYNOLDS NUMBERS AND HYPERSONIC MACH NUMBERS, by Jack D. Whitfield and J. Leith Potter. Rept. on ARO, Inc., Contract AF 40(600)800. Mar 60, 21p. 3 refs. AEDC TN-60-61; AD-234 477.
Order from LC mi$2.70, ph$4.80 PB 146 332

A tentative method for estimating base pressures at hypersonic Mach numbers and at large Reynolds numbers is described. Both blunt and sharp nosed shapes are treated. The procedure is based on existing empirical methods but modifications are made in order to deal with short, blunt bodies. A tendency for base pressure ratios on conical or other flared bodies to increase with Mach number in the hypersonic regime is illustrated. This trend is dependent on body shape and is strengthened by nose bluntness. Refinement and definition of the limitations on the method must await the receipt of experimental data covering a greater range of variables. (Author)

Arnold Engineering Development Center [Tullahoma, Tenn.]
TESTING TECHNIQUE USED FOR FLUTTER TESTS OF MIT SEMI-SPAN WING MODELS AT SUPERSONIC SPEEDS, by L. K. Ward. Rept. on ARO, Inc., Contract AF 40(600)800. July 59, 13p. 2 refs. AEDC TN-59-74; AD-218 737.
Order from LC mi$2.40, ph$3.30 PB 147 600

A description of the testing technique used for flutter tests of cantilevered semi-span wings at high supersonic speeds is presented. Injecting the models into the airstream after the desired tunnel flow was established permitted testing of the necessarily low strength wings at high supersonic Mach numbers (M=1.5 to 5.0). (Author)

Brown U. Div. of Applied Mathematic, Providence, R. I.
SUPERSONIC FLOW PAST FINITE DOUBLE WEDGE WINGS OF VARIABLE THICKNESS. PART II. SINUSOIDAL VARIATION, by Maurice Holt and Bohyun Yim. Rept. on Contract AF 49(638)232. May 60, 41p. 6 refs. AFOSR-TN-60-432.
Order from LC mi$3.00, ph$6.30 PB 147 404

In this paper a wing is considered in which maximum thickness varies sinusoidally with span. (See also PB 147 403)

Convair, Pomona, Calif.
THERMO-ELASTIC EQUATIONS APPLICABLE TO THICK-WALL, POINTED SHELLS OF REVOLUTION, by R. D. Sutherland and R. G. Shook. Rept. on Contract AF 49(638)592. Nov 59, 31p. 4 refs. TM-349-14; AFOSR TN-59-1274; AD-233 395.
Order from LC mi$3.00, ph$6.30 PB 146 439

The thermo-elastic equations necessary to define the stress distribution in a thick-wall, pointed shell of revolution are presented. A coordinate system based on the classic ogive shape which is applicable to a variety of low aerodynamic drag shapes is utilized in

the analysis. Stress functions equations are derived in these ogive coordinates. Techniques are presented for use at the boundaries of the shells of revolution and at the axis of revolution. The equations presented can be solved by numerical methods and are a basis for further work in obtaining analytical solutions to the stresses in thick-wall, pointed shell of revolution. (Author)

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
ON THE TURBULENT BOUNDARY LAYER WITH FLUID INJECTION, by Donald L. Turcotte. Rept. on Contract AF 18(600)1523. July 59, 10p. 6 refs. AFOSR-TN-59-874.
Order from LC mi$1.80, ph$1.80 PB 147 634

By introducing a sublayer region in which the intensity of turbulence grows at a prescribed rate, the reduction in wall shear stress due to fluid injection is found for a turbulent boundary layer. With the decrease in wall shear stress expressed as a function of the ratio of the injection velocity to the friction velocity, the form of the solution is particularly simple. The theory provides a free parameter which can be determined such that the available experimental data are excellently correlated. (Author)

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
POTENTIAL FLOWS IN THE APPROXIMATION OF VISCOUS ACOUSTICS, by William Joseph Rae. Rept. on Contract AF 18(600)1523. June 60, 114p. 18 refs. AFOSR-TN-60-409.
Order from LC mi$6.00, ph$18.30 PB 147 644

Steady, irrotational flows are studied in a linearized approximation, retaining the effects of dispersion and attenuation due to viscosity in the region outside the boundary layer. The differential equation for the velocity potential in this approximation is derived and discussed, and formal solutions for the flow around non-lifting two-dimensional and axisymmetric bodies are found. Approximate evaluations of the formal solution then reveal that throughout all of the subsonic, and most of the supersonic flow field, the inviscid solution is altered by a correction that is first-order in a viscosity parameter. In the supersonic cases, the familiar inviscid wave pattern tends to be dispersed in the vicinity of the body, and at great distances from the body, all disturbances decay. The rates of decay of pressure disturbances at these distances are found, and their relation to the inviscid, nonlinear treatment of the same problem is discussed. In the course of the Fourier analysis of the problem, a Fourier transform which is not listed in any of the standard tables is evaluated, and this provides a closed-form solution to a boundary-value problem involving a certain third-order partial differential equation. Both of these results are thought to be new. (Author)

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
PRELIMINARY STUDIES ON BOUNDARY-LAYER TRANSITION CAUSED BY A THIN TRANSVERSE WIRE FLOATING FROM SURFACE, by Francis R. Hama. Rept. on Contract AF 49(638)645. Apr 60, 27p. 8 refs. Technical note BN-208; AFOSR-TN-60-505.
Order from LC mi$2.70, ph$4.80 PB 147 487

It is found that a thin wire, which is incapable of tripping the flow when it is attached to the surface, can cause transition if it is raised from the surface. A rough criterion of provoking transition at the wire is about 200 - 300 for the Reynolds number based upon the velocity at the top of the wire and the distance of the top of the wire from the surface, although it depends on the combination of the wire diameter and the raised distance from the surface. This criterion is approximately the same as that for the conventional trip wire attached to the surface. But a possible merit as a tripping device is that a thick wire is not required to block the entire height. The Reynolds number based upon the velocity at the top and the wire diameter can be as small as 75 to trip the flow at the wire. Important mechanics involved in this arrangement is the following: the flow underneath the wire tends to separate from the surface immediately behind the wire and to break up three-dimensionally resulting in the formation of longitudinal vortices. Transition is provoked by the coupling between the longitudinal vortices and the two-dimensional vortices formed behind the wire. (Author)

Institute of Engineering Research, U. of California, Berkeley.
THE SURFACE ABLATION OF FIBER REINFORCED PLASTICS PARALLEL TO AN OXYACETYLENE FLAME, by Robert B. Greene. Rept. on Contract DA 04-200-ORD-776. 25 Feb 60, 67p. 20 refs. Technical rept. HE-150-179; Series no. 128, issue no. 4.
Order from LC mi$3.90, ph$10.80 PB 148 008

The present study was initiated to provide some of the information required for selection and design of ablating heat shields at moderate heating rates. Specimens of twelve different fiber reinforced plastics were subjected to flat plate turbulent heating from an oxy-acetylene flame. It was found that when exposed to heating in the 20 to 40 BTU/ft^2 sec range, reinforced phenolic and melamine resins are subject to an unsteady state ablation process characterized by a charred layer of appreciable thickness. This charred layer was found to increase in thickness at a rate of 0.07 to 0.10 inches/min. The thermal diffusivities as a function of temperature were calculated from test data, and found to show a sharp decrease during the initial temperature rise. After the initial decrease the values of the diffusivities generally remained in a range of 0.4×10^{-6} to 2×10^{-6} ft^{2}sec.

Lockheed Aircraft Corp., Sunnyvale, Calif.
GENERAL RESEARCH IN FLIGHT SCIENCES. VOLUME II. FLUID MECHANICS. INVISCID FLOWS. Technical rept. for Jan 58-Jan 59. Jan 59, 166p. 4 refs. LMSD-48381.
Order from LC mi$7.80, ph$25.80 PB 147 667

Contents:
Inviscid hypersonic flow around blunt bodies, by M. Vinokur
Supersonic flow around blunt bodies—an extension of Van Dyke's technique, by M. Vinokur and R. W. Sanders

Surface pressure distribution on blunt bodies at supersonic speeds, by R. M. Mark
An extension of second-order shock expansion theory, by R. Capiaux
Slender body of revolution at hypersonic speeds—"an approximation to the determination of the flow field", by R. Capiaux
A linearized method of characteristics for determining body aerodynamic forces at angle of attack, by J. Der
The Newtonian-diffuse method for computing aerodynamic forces, by W. A. Gustafson

Lockheed Aircraft Corp., Sunnyvale, Calif.
GENERAL RESEARCH IN FLIGHT SCIENCES. VOLUME V. MECHANICS OF DEFORMABLE BODIES. Technical rept. for Jan 58-Jan 59. Jan 59, 323p. 8 refs. LMSD-48381.
Order from LC mi$11.10, ph$50.10 PB 147 668

Contents:
Creep instability and collapse of initially straight columns, by W. E. Jahsman
A theory of creep instability of initially straight columns, by W. E. Jahsman and F. A. Field
A theory for predicting creep buckling of straight columns and flat plates, by R. F. Crawford
A study of creep collapse of a long circular cylindrical shell under uniform external pressure, by N. J. Hoff, W. E. Jahsman, and W. Nachbar
Oscillations of pressurized cylindrical shells, by H. V. Hahne
Discontinuity stresses in pressurized thin shells of revolution, by W. Nachbar
Analysis of thermal stress and deflection in shells of revolution, by Hsu Lo and Edward Y. W. Tsui
Buckling of a cylindrical shell pressurized over a circumferential band and stabilized by a soft, elastic core, by D. O. Brush and F. A. Field
Thermal stress analysis by energy methods, by L. A. Riedinger
Oscillations of a propellant wall, by J. Lenoir
(See also PB 147 667)

Michigan U. Research Inst., Ann Arbor.
TABLE OF PRESSURE RATIOS P_i/P_c AND P_c/P_a vs. MACH NUMBER FOR A 15° RIGHT CIRCULAR SUPERSONIC CONE ($\gamma = 1.405$) by N. W. Spencer. Scientific rept. no. ES-3 on Contract AF 19(604)1948. Sep 58, 106p. 4 refs. 2597-7-S; AFCRC-TN-58-622.
Order from LC mi$5.70, ph$16.80 PB 137 829

This report presents a table of pressure ratios to be found on a 15° right circular cone tabulated versus the free-stream Mach number. The pressure ratios are given to five significant figures against 0.001 increments of the argument. The argument ranges from $M_1 = 1.048$ to $M_2 = 3.895$. Given are the ratio of total head pressure (P_i) to the cone-surface pressure (P_c) and the ratio of the cone-surface pressure (P_c) to the free-stream static pressure (P_a). With these tables and two pressures on a right circular cone, it is possible to determine the free-stream Mach number and the free-stream static pressure. By measuring the free-stream velocity (or the velocity of the cone throught the media if that is the situation) in addition, it is possible to compute free-stream static temperatures and densities. (Author)

Oklahoma Agricultural and Mechanical Coll., Stillwater.
OPTICAL BIREFRINGENCE INDUCED BY SHEAR WAVE PROPAGATION IN AQUEOUS MILLING YELLOW SOLUTIONS, by George B. Thurston, Logan E. Hargrove, Jr. and Marvin Y. Edmison. Technical rept. no. 4 on Research in Nonlinear Properties of Fluid Flow Through Circular Orifices, Contract DA 23-072-ORD-583. June 57, 74p. 27 refs. OOR rept. no. 1336.4; AD-135 029.
Order from LC mi$4.50, ph$12.30 PB 147 857

The optical interference patterns observed in a flow-birefringent fluid when viewed between crossed plane-polarizing plates are related to the fluid motion. This work is a study of the observed optical interference patterns caused by an oscillating plane in a flow-birefringent fluid, an aqueous solution of milling yellow dye. Optical and hydrodynamic theory is reviewed and experimental methods and results are presented. It is found that the optical interference patterns exhibit wave properties which are related to the wave of transverse fluid vibrations. Properties of the optical interference patterns are presented as a function of phase, velocity amplitude, and frequency. The effects of geometry of flow facility, optical system alignment, and edge effects are discussed. Consideration is given the optical and rheological properties of the fluid. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
ANALYTIC SOLUTIONS OF PLANAR REENTRY TRAJECTORIES WITH LIFT AND DRAG, by Kenneth Wang and Lu Ting. Rept. on Contract AF 49(638)445. Apr 60, 75p. 7 refs. PIBAL rept. no. 601; AFOSR-TN-60-508.
Order from LC mi$4.50, ph$12.30 PB 148 088

The method of Lees, Hartwig, and Cohen is modified, so that the gravitational and the centrifugal terms in the equation of motion normal to the trajectory can be retained. Analytic solutions for planar shallow reentry trajectories are obtained. For constant lift and drag coefficients, algebraic relationship between the local inclination and the density or elevation and that between the velocity and density are obtained. The first relationship is independent of the drag coefficient; therefore the result of the first relationship can be tabulated for various values of lift coefficient only. If the lift and drag coefficients are given functions of elevation, similar analytic relationships can be obtained by simple quadratures. The analytic solutions are employed to determine the acceleration, in particular the maximum acceleration, along the trajectory. As applied to the skip trajectories, the minimum elevation and the exit condition of each skip are determined. (Author)

Princeton U., N. J.
THE UNSTEADY LAMINAR BOUNDARY LAYER ON A FLAT PLATE, by Sin-I Cheng and David Elliott. Rept. on Contract AF 18(600)498. Sep 55, 103p. 16 refs. Princeton rept. no. 318; AFOSR TN-56-115; AD-82 511.
Order from LC mi$5.70, ph$16.80 PB 148 037

The unsteady laminar boundary layer on a flat plate moving with an arbitrary velocity $U_\omega(t)$ into an in-

compressible fluid at rest has been investigated in this paper. The motion is taken to start from rest at a time $t = 0$ with $U_\omega(t)$ continuous at $t = 0$ and infinitely differentiable for all $t > 0$. Under these conditions a solution is constructed which is valid for all t and x, where x is the distance from the leading edge of the plate. The solution is also shown to be valid for the flow after a long time when $U_\omega(t)$ does not satisfy the above conditions. Finally, the effect of compressibility for small Mach numbers has been discussed briefly. (Author)

Rensselaer Polytechnic Inst., Troy, N. Y.
SOME EFFECTS OF SURFACE CURVATURE ON THE LAMINAR BOUNDARY LAYER FLOW, by K. Toba. Rept. on Contract AF 49(638)23. Mar 60, 28p. 5 refs. TR AE 5904; AFOSR-TN-60-448.
Order from LC mi$2.70, ph$4.80 PB 147 754

In a recent report (PB 136 251) K. T. Yen presented a new theory of laminar boundary layer flow. By adopting the natural coordinates the boundary layer approximation is made so that surface curvature effects are taken into account. In this report, further elaboration of the proposed formulation is made and the effects of surface curvature are evaluated for a family of surfaces which yield similar solutions. Numerical results for the velocity profiles and the wall skin friction distribution obtained by means of a high speed computer are presented and analyzed. (Author)

Training Center for Experimental Aerodynamics (Belgium).
LAMINAR SEPARATION IN SUPERSONIC FLOW WITH EMPHASIS ON THREE-DIMENSIONAL PERTURBATIONS AT REATTACHMENT, by Jean J. Ginoux. Final rept. on Contract AF 61(514)993. Feb 60, 44p. 7 refs. TCEA Technical note 3; AFOSR-TN-60-237.
Order from LC mi$3.30, ph$7.80 PB 147 503

Regular and repeatable span-wise flow perturbations exist in the reattachment region of a laminar supersonic boundary-layer on a two-dimensional backward-facing step model. The model span and leading-edge thickness, when below 0.1 mm, had no effect on the wave-length of the flow perturbations. On backward facing-steps, at a Mach number of 2.16, the ratio of wave-length of the flow perturbations to boundary-layer thickness was a function of the ratio of step-height to boundary-layer thickness. Similar perturbations were found at the reattachment region of a laminar boundary-layer on forward-facing steps, on compression-corners, on rectangular cavities and in the case of interaction between a shock-wave and the boundary-layer. They were also detected in unseparated boundary-layers. The presence of three-dimensional perturbations seems to be related to the general question of boundary-layer stability. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
OBSERVATIONS ON BUBBLE GROWTHS IN VARIOUS SUPERHEATED LIQUIDS, by Paul Dergarabedian. Rept. on Contract N123s91875. 26 Jan 56, 19p. 5 refs. NAVORD rept. 5009.
Order from LC mi$2.40, ph$3.30 PB 148 378

Experimental data are presented for the growth of vapor bubbles in various superheated liquids, such as carbon tetrachloride, benzene, ethyl alcohol, and methyl alcohol. These data are compared with the theoretical results obtained by Plesset and Zwick who derived these results by taking into account the heat diffusion across the bubble boundary. The agreement in all cases between experiment and theory is found to be good. The growth of vapor bubbles in slightly superheated water is also presented in the form of experimental data for bubbles just beginning to grow from a point of equilibrium which is presumed to be dynamically unstable. The radii corresponding to the points of equilibrium are of the same order of magnitude as predicted by theoretical considerations. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
A MODEL OF TURBULENCE DISPLAYING AUTONOMOUS OSCILLATIONS, by R. J. Dickson. Technical memo. 25 Mar 59, 24p. 4 refs. LMSD-48466.
Order from LC mi$2.70, ph$4.80 PB 147 671

This report presents the results of the attempt to find and treat simplified examples of problems governed by nonlinear space-time systems. The introduction sketches the general setting of a "Model of Turbulence" in the sense of J. M. Burgers, and directs attention to the character of the particular problem considered here. Section 2 introduces a special class of nonlinear ordinary differential equations and explains its relationship to a partial differential system studied by Burgers. Section 3 takes the first step in a detailed study of this class of equations.

Wigley, C. (Gt. Brit.)
CALCULATION OF WAVE RESISTANCE AT LOW AND MODERATE SPEEDS, by C. Wigley. Rept. no. 1 on Contract N62558-1772. May 59, 51p. 12 refs.
Order from LC mi$3.60, ph$9.30 PB 146 294

METALLURGY

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
SELECTED REFERENCES ON BRITTLE FRACTURE, by Don Owens and Lynne Doss. 5 May 60, 65p. 822 refs. DMIC memo. 55.
Order from OTS $0.50 PB 161 205

The purpose of this bibliography is to bring together the results of past and current studies of the subject in view of its renewed importance as an obstacle in the missile and space programs. The references have been categorized and cross referenced as testing techniques; low-temperature fracture; fracture of welded structures; influence of processing variables other than welding; temper brittleness; hydrogen embrittlement; influence of composition on brittle fracture; ductile-to-brittle transition; stress-corrosion cracking; funda-

mental studies and status of research; fracture of nonferrous materials; design considerations; case histories; and methods of circumventing brittle fracture. This collection of references is not a complete one and will be revised and expanded as the acquisition of new references makes the need apparent.

Defense Metals Information Center, Battelle Memorial Inst., Columbus.
A SUMMARY OF COMPARATIVE PROPERTIES OF AIR-MELTED AND VACUUM-MELTED STEELS AND SUPERALLOYS, by D. C. Ludwigson and F. R. Morral. Rept. on Contract AF 18(600)1375. 28 Mar 60, 147p. 58 refs. DMIC rept. 128.
Order from OTS $2.75 PB 151 085

A compilation of data comparing the mechanical properties of vacuum-poured, vacuum-induction-melted, and consumable-electrode vacuum-arc-remelted alloys with those of their air-poured or air-melted counterparts is presented. Specific alloy classes considered are (1) low-alloy steels, (2) hot-work die steels, (3) stainless steels, (4) iron-base superalloys, (5) nickel-base superalloys, and (6) cobalt-base superalloys. In most cases the vacuum-treated materials exhibited better mechanical properties. (Author)

Istituto Elettrotechnico Nazionale "Galileo Ferraris" (Italy).
INTERNAL FRICTION OF FeAl ALLOYS DUE TO SOLUTE ATOM PAIRS. REMARKS ON THE THEORY OF THE EFFECT, by Guiseppe Biorci, Andrea Ferro, and Giorgio Montalenti. Technical note 4a on Contract AF 61(514)1331. Jan 60, 56p. 42 refs. AFOSR-TN-60-495.
Order from LC mi$3.60, ph$9.30 PB 147 501

The internal friction due to directional short range order in Fe Al alloys has been studied. At the frequency of about 1 cps the effect appears at about 510°C with a relaxation time corresponding to a process of substitutional diffusion. The intensity of the effect increases rapidly for concentrations above 10%, and then drops to low values in the region of Fe_3 Al, where the order occurs. Hence the curve of the intensity of the effect as a function of concentration is, with fairly good agreement, proportional to the number of solute Al pairs, as deduced from X rays results of Bradley and Jay. However some deviation from ideality seems to be present also at low concentrations. (Author)

James Forrestal Research Center, Princeton, N. J.
SELF-DIFFUSION OF IRON AND SULFUR IN FERROUS SULFIDE, by Ralph H. Condit and C. Birchenall. Rept. on Contract AF 49(638)533. Mar 60, 126p. 67 refs. Metallurgy rept. no. 24; AFOSR-TN-60-245.
Order from LC mi$6.30, ph$19.80 PB 147 772

Measurements of the self-diffusion of iron and sulfur in ferrous sulfide single crystals are reported as a function of temperature, deviation from stoichiometric composition, and crystallographic direction. Iron self-diffusion is primarily by a vacancy mechanism, the vacancies being provided by the iron deficit plus a small intrinsic disorder. Details of the diffusion mechanism are discussed, and it is concluded that direct jumps between normal sites aligned along the c-axis are favored over jumps from normal to interstitial sites which might then be followed by later jumps into new normal sites. However, the Bardeen-Herring correlation factor appears to operate in such a way that the rate limiting step for diffusion in both crystallographic directions is the jump from normal to interstitial sites.

Metcut Research Associates, Inc., Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS. ITEM V, PART II:, MACHINING CHARACTERISTICS OF MOLYBDENUM - 0.5% TITANIUM ALLOY, by Leonard J. Nowikowski. Rept. for 1 Jan-30 Apr 60 on Subcontract to Contract AF 33(600)35967. 6 May 60, 75p. Wright Aeronautical serial rept. no. MP.00-210.
Order from OTS $2.00 PB 161 775

A study of the machining characteristics of a molybdenum alloy containing 1/2 percent titanium (Mo-1/2% Ti) has been conducted for turning, face milling, drilling, reaming and tapping operations. The data for the various machining tests is presented in graphical form to show the relationships between tool life, cutting speed, feed, tool geometry, tool material and cutting fluids. Grinding tests were conducted to determine the effect of grinding wheel grade, wheel speed, down feed, cross feed, and table speed on grinding ratio (G) and surface finish. The data for these studies is presented in graphical form to show G ratio as a function of grinding variables. Results of individual tests including surface finish data are shown in tabular form. Force measurements were made for turning and drilling the molybdenum alloy. The data is shown in graphical form to indicate the effect of machining variables on unit power, coefficient of friction and tool forces. (Author)

Michigan U. Research Inst., Ann Arbor.
NOTCH SENSITIVITY OF HIGH-TEMPERATURE ALLOYS, by Howard R. Voorhees and James W. Freeman. Rept. for Apr 58-June 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5775. Mar 60, 55p. 50 refs. WADC Technical rept. 59-470.
Order from OTS $1.50 PB 161 796

All available results on creep-rupture of notched specimens are critically examined. Analysis of observed behavior suggests a requirement of an early redistribution of concentrated multiaxial stress. A program is outlined for research on crack initiation and propagation during creep-rupture to verify a hypothesized dual role of maximum principal stress and shear-stress invariant in notched-bar rupture behavior. (Author)

Office of Ordnance Research, Durham, N. C.
CONFERENCE ON BASIC RESEARCH IN METALLURGY, 20 MARCH 1958. [1958] 120p.
Order from LC mi$6.00, ph$18.30 PB 146 040

Contents:
Certain intermediate phases in alloys on the first, second and third long period transition elements.

Solid solution strengthening of magnesium single crystals at room temperature.
Lattice imperfections of magnesium metal and alloys.
Research on the structure of sintered carbides.
Internal friction in alloys with BCC structure.
Reports on research in progress

Ferrous Metals

Alabama U., University.
INFLUENCE OF THERMAL CYCLING ON THE BRITTLE TRANSITION TEMPERATURE OF LOW-CARBON STEEL, by Harry Majors, Jr. Technical rept. no. 2 on Contracts DA 01-009-ORD-396 and DA 01-009-ORD-454. Oct 57, 21p. 8 refs. OOR rept. no. 1230.3; AD-146 076.
Order from LC mi$2.70, ph$4.80 PB 147 861

The effects of thermal cycling on the brittle transition temperature of low carbon steels were investigated. Grooved-tension impact specimens of 2 steels were fully annealed and subjected to the following thermal cycling treatments (1) 300° to 1000° to 300°F and (2) 1000° to 1500° to 1000°F. Heating from 300° to 1000°F required 2 min and cooling from 1000° to 300°F required 45 sec. Quenching from 1500° to 1000° required 3 min. No changes in hardness (69 Rockwell B) and no alteration in grain size were effected by the 300° to 1000°F cycling. The average hardness was 75 Rockwell B with a refinement of grains after the 1000° to 1500°F cycling treatment. Tension impact tests were conducted between -100° and +90°F in a Baldwin Sountag model S1-1 testing machine. Some preliminary conclusions were (1) that thermal cycling across the thermal critical point lowered the brittle transition temperature, and at all temperatures down to -100°F there was some macroscopic plastic flow, and (2) that thermal cycling in the region of 300° to 1000°F tended to broaden the range of temperature transition from brittleness (0.00 in./in. true plastic fracture strain) to large ductility (0.35 in./in. true plastic fracture strain).

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
FATIGUE DATA ON PRECIPITATION-HARDENABLE STAINLESS STEELS, by R. J. Favor, H. J. Grover, and W. P. Achbach. 11 Mar 60, 16p. 6 refs. DMIC memo. 46; AD-234 805.
Order from OTS $0.50 PB 161 196

Naval Research Lab., Washington, D. C.
HEAT TREATMENT OF Mn-V-Mo AGE-HARDENING AUSTENITIC STEEL, by N. C. Howells and E. A. Lange. Interim rept. 16 May 60, 10p. 2 refs. NRL rept. 5464.
Order from OTS $0.50 PB 161 370

The age-hardening characteristics of Mn-V-Mo austenitic steels have been determined as a function of the temperature of the solution treatment. The optimum condition for developing the full age-hardening potential of an alloy is 1/2 hour at 2100°F followed by a water quench. Subsequent aging treatments required for maximum-hardness levels are: 1 hour at 1400°F, 6 hours at 1300°F, or 16 hours at 1200°F. An aging temperature between 1200°F and 1300°F is optimum for controlling the balance between yield strength and ductility. The yield strength of metals in the fully-aged condition is directly proportional to Brinell hardness, ranging from 80,000 to 150,000 psi for the compositions investigated. (Author)

Watertown Arsenal Labs., Mass.
CIRCULAR-PATCH TEST FOR EVALUATING ARMOR CRACK-SUSCEPTIBILITY, by Laurence E. Poteat and Richard W. Jones. May 60, 37p. 10 refs. WAL TR 710/1075.
Order from OTS $1.00 PB 161 822

An investigation was conducted to determine the effect of different procedures on the effectiveness of the circular-patch test specimen in the evaluation of plate crack susceptibility and to determine conditions suitable for a standard test. A test procedure was selected and used on several different heats of armor steel. Evaluation of these heats by this procedure placed the heats in the correct order of crack susceptibility as determined from the known fabrication history of the heats. (Author)

Watertown Arsenal Lab., Mass.
EXOTHERMIC RISERING EFFECTS ON PROPERTIES OF CAST ARMOR STEEL, by John M. Ingraham. June 60, 35p. 6 refs. WAL TR-616.1/1.
Order from OTS $1.00 PB 161 698

This is a limited study of the effects of the use of exothermic riser sleeves on the physical and mechanical properties of a cast armor test plate. The work reported herein consists of studies to determine hardness, macro- and microstructure, tensile and impact properties in areas adjacent to and removed from the riser area. (Author)

Watertown Arsenal Labs., Mass.
FORGING EFFECTS ON THE MECHANICAL PROPERTIES OF THREE BORON-TREATED STEELS, by Eugene DiCesare. July 59, 48p. 2 refs.
WAL TR 312/80; AD-219 749
Order from OTS $1.25 PB 151 814

Steel alloys 14B35, 14B50, and 10R70 containing boron and rare earth were hot forged (2250°F) by upsetting and drawing out (swaging) with reduction ratios up to 8 to 1 and 13 to 1, respectively. Longitudinal and transverse tensile and Charpy specimens, and micro and macrospecimens were tested and examined in the as-forged and in the heat-treated condition. Heat treatment resulted in optimum tensile properties and toughness in both the upset-forged and the drawnout, or swaged, ingots, at approximately 66% reduction for the swaged ingots, 50% reduction for the upset-forged 14B35 alloy, and 0% reduction for the upset-forged 14B50 and 10R70 alloys. (Author)

Watertown Arsenal Labs., Mass.
HIGH STRENGTH STEEL: EFFECT OF VARYING COMPOSITION TO A TARGET HARDENABILITY, AND AN EXPERIMENTAL SILICON-RICH BORON-TREATED LOW ALLOY STEEL, by S. V. Arnold.

Oct 59, 39p. 11 refs. WAL TR 320. 1/1; AD-226 966.
Order from OTS $1.00 PB 161 007

The tensile, notched tensile and impact properties of a number of experimental 0.30% carbon nickel-chromium-molybdenum steels, made to target composition of calculated 15" DI hardenability, were determined after quenching and tempering at 450°F. Tensile notched tensile and impact properties of an experimental 0.33% carbon silicon-rich boron-treated steel with moderate amounts of chromium and molybdenum, when quenched and tempered within the range 450°-700°F, were exceptionally good. (Author)

Watertown Arsenal, Mass.
OBTAINING LEAST-COST FURNACE INPUT MIXES BY LINEAR PROGRAMMING, AND SOME INVENTORY IMPLICATIONS, by Gideon I. Gartner. July 59, 77p. 13 refs. Management Science rept. no. MS-1; AD-233 226.
Order from LC mi$4.50, ph$12.30 PB 146 836

Many combinations of furnace input materials exist, which will meet a set of given furnace output requirements. The linear programming technique can be used to choose that feasible material combination whose material cost is a minimum. The technique can be used to calculate optimal prescriptions for individual heats, or to determine which materials to buy to stock in inventory. While previous work has been done on the individual heat problem, this project is concerned with the "what to buy" decision. Several possible management policies which concern the extent to which linear programming might be used are described as are the implications of a linear programming based system to economic lot size determination. To justify the use of L. P. in this application as well as to illustrate several points, a number of problems, hypothetical and real, were solved on the IBM 704. (Author)

Watertown Arsenal Labs., Mass.
RISIDUAL TENSILE STRESS CONCENTRATIONS AND TENSILELY-STRESSED CRACKS VERSUS TOUGHNESS OF HEAT-TREATED AISI 4340 STEEL, by S. V. Arnold. May 60, 18p. 2 refs. Technical rept. no. WAL TR 834.21/1.
Order from LC mi$2.40, ph$3.30 PB 147 506

By bending standard Charpy V impact specimens over a fulcrum placed against the mouth of the notch, altered specimens were obtained with angles of permanent set ranging from a fraction to several degrees. The metal at the base of the Charpy notch underwent permanent compressive deformation and then, upon release of load, this metal was placed in residual tension by elastic recovery of the specimen. Incipient cracks formed at the base of the notch. Specimens were tested in impact over a range of temperatures to determine the effect of such alterations upon energy level and transition behavior of AISI 4340 steel quenched and tempered to various strength levels. (Author)

Watertown Arsenal Labs., Mass.
SPECTROCHEMICAL DETERMINATION OF ACID-SOLUBLE ALUMINUM IN LOW-ALLOY STEELS BY THE ROTATING-DISC METHOD, by F. G. Howell. June 59, 20p. 16 refs. Technical rept. WAL TR 804/19; AD-217 440.
Order from OTS $0.75 PB 151 812

A spectrographic method for the determination of acid-soluble aluminum in low-alloy steels was developed using a solution technique with a rotating graphite disc and a high-voltage alternating current spark. The method is rapid compared to chemical analysis, permitting a considerable saving in time. Of the common alloying elements used in low-alloy steels, only tungsten interferes. The method applies to samples containing 0.02% to 0.25% acid-soluble aluminum. This range includes most of the samples submitted for analysis. (Author)

Light Metals

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF MINIMUM DESIGN DATA ON THE NEW TITANIUM ALLOYS BEING CONSIDERED IN THE TITANIUM SHEET-ROLLING PROGRAM, by W. W. Breindel, C. L. Seale and others. Quarterly rept. no. 4 on Contract NOas 57-148-C. 20 Feb 58, 17p. 4 refs; AD-158 618.
Order from LC mi$2.40, ph$3.30 PB 147 733

The effect of the ratio of the pin diameter to sheet thickness on the bearing strength is discussed. The decision was made to investigate this relationship for heat-treated 6 Al-4V Ti alloy. The use of the single shear-type specimen is illustrated by the presentation of additional data. Compression test procedures are described, and data are presented on annealed 6 Al-4V Ti alloy at testing temperatures of 80°, 400°, 600°, 800°, and 900°F. A tension apparatus was evaluated which permits the use of the same extensometer as that used for compression tests.

Battelle Memorial Inst., Columbus, Ohio.
METALLURGICAL AND MECHANICAL CHARACTERISTICS OF HIGH-PURITY TITANIUM-BASE ALLOYS, by Richard W. Douglass, Frank C. Holden and others. Rept. for 15 Feb 58-15 Aug 59 on Metallic Materials, Contract AF 33(616)5462. Mar 60, 154p. 15 refs. WADC Technical rept. 59-595.
Order from OTS $3.00 PB 161 817

The relationships between mechanical properties, alloy composition, microstructure, and thermal history have been studied for high-purity titanium-base alloys. The alloy systems investigated include Ti-V, Ti-Cr, and Ti-W binary alloys, and Ti-Al-V, Ti-Al-Cr, Ti-O-V, Ti-O-Cr, and Ti-O-Mn ternary alloys. Mechanical-property data include tensile and flow properties, impact behavior, hardness, aging, and cooling-rate data. The effects of dispersions on the creep of Ti-W, Ti-Cu, and Ti-Si alloys were investigated. The metallurgical principles involved here and in previous work are discussed. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
BERYLLIUM: A SEARCH OF THE LITERATURE 1957-1959, by Kenneth D. Carroll. Technical rept. Jan 60, 116p. 349 refs. LMSD-288190.
Order from OTS $2.50 PB 161 811

The broad field of beryllium metallurgy, crystallography, fabrication methods, and the application of Be to the aircraft and missile fields has been reviewed. References to the use of Be in nuclear reactors, nuclear fuels, and the effects of radiation have been omitted. There are references included as to the toxicology of Be, its hazard limits, and means of detection; however, this phase was of tangental interest and the references are not exhaustive. References to Cu-Be alloys have been omitted, but abstracts are included covering other Be alloys. The majority of the items cited have been abstracted; however, various annual reviews and progress reports were not. (See also PB 161 012)

Lockheed Aircraft Corp., Sunnyvale, Calif.
BERYLLIUM: SURVEY OF THE LITERATURE (SUBJECT) by K. D. Carroll. Special Bibliography. 1 Apr 60, 60p. 135 refs. LMSD 288190, Suppl. no. 1.
Order from OTS $1.50 PB 161 812

See also PB 161 811

Office of Technical Services, Dept. of Commerce, Washington, D. C.
BERYLLIUM (1945-1960). June 60, 19p. 362 refs. OTS Selective Bibliography 413.
Order from OTS $0.10 OTS SB-413

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations. Reports are arranged in categories as follows: beryllium metals and alloys; beryllium compounds, carbides, and isotopes; toxicity, safe handling of beryllium; translations on beryllium.

Watertown Arsenal Labs., Mass.
DETECTION BY NONDESTRUCTIVE TESTS OF OVERHEATING IN 2014-T6 ALUMINUM ALLOY, by Patrick C. McEleney and Everett L. Reed. May 60, 44p. 4 refs. WAL TR-140/27.
Order from OTS $1.25 PB 161 516

Ultrasonic attenuation tests have proved to be successful in the detection of "overheating" or "burning" in 2014-T6 aluminum alloy. Heretofore overheating was detected only by metallographic examination. Correlation between ultrasonic attenuation tests and metallographic studies of a series of overheated and nonoverheated 2014-T6 aluminum alloy samples has been successfully accomplished. Liquid penetrant, radiographic and electromagnetic tests can also be applied in certain instances to detect this condition. (Author)

Nonferrous (except light) Metals

Battelle Memorial Inst., Columbus, Ohio.
HIGH-TEMPERATURE PROPERTIES AND ALLOYING BEHAVIOR OF THE REFRACTORY PLATINUM-GROUP METALS, by R. W. Douglass, F. C. Holden, and R. I. Jaffee. Technical phase rept. on Contract Nonr-2547(00). 14 Aug 59, 127p. 286 refs. AD-226 310.
Order from OTS $2.75 PB 161 823

A survey of the literature pertaining to the platinum-group metals and their alloys has been conducted as a part of the study of the metallurgical properties of the refractory platinum-group metals. Major emphasis was placed on the four more refractory metals: rhodium, iridium, osmium, and ruthenium. A selected bibliography and a list of references are included. (Author)

Climax Molybdenum Co. of Michigan, Detroit.
ARC-CAST MOLYBDENUM AND TUNGSTEN BASE ALLOYS (1957-1959) by M. Semchyshen and R. Q. Barr. Rept. on Contract Nonr-2390(00). 1959, 205p. 12 refs.
Order from OTS $3.50 PB 161 820

The studies can be categorized in the following manner: (1) Alloy Systems: This phase involves an investigation of molybdenum-base alloys containing substantial amounts of alloying addition. (2) Strengthening Mechanisms in Molybdenum-Base Alloys: Previous studies have shown that carbon plays a major role in the development of high temperature strength in Mo-Ti-C alloys. These studies have been continued and expanded to include Mo-Zr-C and Mo-Hf-C alloys. (3) Mechanical Properties of As-Cast Molybdenum-Base Alloys. Molybdenum-base alloys containing additions in excess of those which can be worked by presently-available facilities have demonstrated high elevated temperature hardness. (4) Evaluation of Electron-Beam Melted Molybdenum: Ingots melted by the electron-beam technique have been evaluated from the standpoint of purity and transition temperature in tension. (5) Tungsten-Base Alloys: A preliminary survey of tungsten-base alloys has been initiated. (6) Determination of Elastic Moduli of Molybdenum and Commercial Molybdenum-Base Alloys: The modulus of elasticity has been determined from tension stress-strain data for unalloyed molybdenum, Mo + 0.5% Ti, Mo + 0.5% Ti + 0.7% Zr, and Mo + 0.5% Zr over the range from room temperature to 2400 F.

Structural Metallurgy and Corrosion

Armour Research Foundation, Chicago, Ill.
PHASE RELATIONSHIPS IN SELECTED BINARY AND TERNARY VANADIUM-BASE ALLOYS SYSTEMS, by Steven A. Komjathy, Robert H. Read, and William Rostoker. Rept. for 1 May 58-31 July 59 on Solid State Research and Properties of Matter, Contract AF 33(616)5771. Jan 60, 79p. 35 refs. WADC Technical rept. 59-483.
Order from OTS $2.00 PB 161 816

In order to obtain information for the development of vanadium-base alloys, binary systems (V-La, V-Ce, V-Pr, V-Nd, V-Gd, V-Sn, V-Hf, V-Th, V-W and V-Re) and ternary systems (V-Ti-Nb, V-Ti-Mo, V-Ti-Ta, V-Ti-W, V-Ti-O, V-Ti-Si, and V-Ti-Be) were investigated for (1) the extent of the vanadium-rich solid solution between 800° and 1500°C, (2) the character of the second phase in equilibrium with the solid solution, and (3) the possible melt reaction. Metallographic examination, X-ray powder diffraction analysis, incipient melting point determination, differential thermal analysis, and microhardness tests were used as experimental technique. The experimental results are illustrated by partial phase diagrams, where it was necessary. In some cases work was done on compositions with less than 50 w/o V to resolve certain problems. Precipitation kinetics studies were carried out on selected alloy compositions in ternary systems V-Ti-O, V-Ti-Si, and V-Ti-Be. The age hardening of the alloys at 550°, 650°, and 750°C was followed by routine Vickers hardness tests. (Author)

Bureau of [Naval Weapons] Washington, D. C.
PROCESS OF APPLYING POLYTETRAFLUORETHYLENE COATINGS ON STEEL SURFACES. 11 Jan 56, 10p. NAVORD OD 10362.
Order from LC mi$1.80, ph$1.80 PB 148 650

Dayton U., Ohio.
ON THE FEASIBILITY OF USING X-RAY FLASH TECHNIQUES FOR DIFFRACTION STUDIES, by Werner R. Rambauske. Rept. for June-Dec 59 on Thermodyanmics and Heat Transfer, Contract AF 33(616)6607. Mar 60, 61p. 23 refs. WADD Technical rept. 60-55.
Order from OTS $1.75 PB 161 797

X-ray diffraction and other methods concerned with the analysis of the microstructure of matter are limited by relatively small radiation intensities. The feasibility of utilizing highly intense X-ray flash techniques are studied herein with actual Laue diffraction pictures obtained in very short times (microseconds) also presented. (Author)

Florida U. Engineering and Industrial Experiment Station, Gainesville.
THE EFFECT OF FOREIGN SUBSTANCES ON THE STRENGTH OF POWDER-METAL AGGREGATES, by Otto Zmeskal. Final rept. on Contract DA 01-009-ORD-439. 30 Sep 58, 119p. 1 ref; OOR rept. no. 1423.1: AD-206 839.
Order from LC mi$6.00, ph$18.30 PB 147 869

The report is divided in four parts, each dealing with a different pure metal. The metal matrices covered are copper, titanium, zirconium, and iron. The oxides were introduced by mixing the pure oxides with the pure metal powders. For each metal a program was devised to determine the optimum conditions of particle size, method of aggregation, pressing pressure, sintering atmosphere and temperature and additional pressing and sintering operations. The criteria used were density and hardness. Both cylinders and tensile bars were evaluated. The oxide added to copper was titania. This oxide was also used as the dispersed phase in titanium; to minimize oxide solubility, low temperature sintering was used with tin as the bonding agent. Zirconia was added to zirconium; both hydride zirconium and high purity zirconium metal were used, but in both instances the resultant products were very brittle. The greatest amount of work was done with carbonyl iron. The oxides added included zirconia, thoria, ceria, lanthana, aeodymia, dysprosia, and gadolinia. Lanthana was found to prevent bonding of the iron matrix, while the other oxides were found to be only slightly embrittling. The iron - gadolinia mixture offers considerable promise for a control rod material in nuclear applications. In general, the oxide additions to each metal investigated resulted in increased hardness and strength at elevated temperatures.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
THIN METAL FILMS AS CORROSION INDICATORS, by Richard B. Belser and Frank E. Hankinson. Rept. for 15 Nov 57-15 Nov 58 on Finishes and Materials Preservation, Contract AF 33(616)3879. May 59, 56p. 11 refs. WADC Technical rept. 59-149; AD-214 886.
Order from OTS $1.50 PB 151 974

Investigation of the corrosion behavior of thin metal films for possible utilization in economic and reliable corrosion indicators. The corrosion behavior of iron, bimetal films of iron and copper, manganese, and metal films sensitized by salts were observed in various cleaning procedures were examined. Natural corrosion of a metal film appeared to be a two-stage process. Sensitization of the metal film negates one of the steps and the film becomes primarily an integrator of the conditions of temperature and humidity to which the film is subsequently exposed. Both sensitized and unsensitized metal films may be needed to indicate corrosive conditions. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTRONIC STRUCTURE OF BERYLLIUM, by George C. Kuczynski. Technical memo. Aug 59, 28p. 10 refs. LMSD-288003; AD-226 302.
Order from LC mi$2.70, ph$4.80 PB 147 681

The theoretical model of beryllium proposed by Herring and Hill [Phys. Rev. 58:132, 1940] is capable of explaining most of the apparent anomalies of the physical properties encountered in this metal. The high Debye temperature is due to high binding energy not unusual in the metals of the first row of the periodic table, whose nuclei are only feebly screened by ls shell electrons. Although the crystallographic structure of beryllium is not predictable from the theory, the electron distribution within the first Brillouin zone seems to lead to a good qualitative correlation of the electrical magnetic properties. Further extension of the theory is capable of accounting for the apparently anomalous change of c/a ratio with temperature, as this report attempts to demonstrate. The only real anomaly which cannot be properly explained is a very low value of the Poisson's ratio. This may be because the present determinations of the elastic constants are not entirely trustworthy. (Author)

Massachusetts Inst. of Tech., Cambridge.
THE INITIAL STAGES OF PLASTIC DEFORMATION IN ALUMINUM AND COPPER, by A. R. Rosenfield (Master's thesis) and B. L. Averbach. Technical rept. no. 1 on Contract Nonr-1841(35). 1959, 48p. 22 refs. AD-226 097.
Order from LC mi$3.30, ph$7.80 PB 148 153

The early stages of plastic flow and microcreep in aluminum and copper have been studied with a strain sensitivity of 2×10^{-6} at temperatures ranging from 25°C (77°F) to -196°C (-321°F) as a function of composition and substructure. The temperature dependence of the elastic limit in both materials is interpreted as arising from a thermal activation of stacking faults under stress, and this model results in values of 65 and 210 ergs/cm^2 for the stacking fault energies of copper and aluminum, respectively. The effects of impurities differ in the two materials and have been ascribed to the presence of precipitates in aluminum and solid solution formation in the case of copper. The jog formation energy in both materials has been measured from an analysis of the stress-strain curve on unloading, giving a value of 0.49 e.v. for copper and 0.21 e.v. for aluminum. (Author)

National Research Labs., Ottawa (Canada).
THERMAL STRESSING DUE TO AN ARBITRARY HEAT SOURCE IN A CIRCULAR CUT-OUT, by G. R. Cowper. Mar 60, 26p. Mechanical Engineering rept. MS-101.
Order from LC mi$2.70, ph$4.80 PB 147 915

This report presents formulas for the thermal stresses and displacements in a circular elastic plate with a concentric circular cut-out due to an arbitrary but steady heat input at the edges of the plate. Formulas for thermal stresses in an infinite plate with a single circular cut-out are obtained as a limiting case. Numerical results are worked out for the case in which an arbitrary arc of the edge of the cut-out is held at a high temperature while the remainder of the edge remains cool. (Author)

Naval Engineering Experiment Station, Annapolis, Md.
INVESTIGATION OF CORROSION INHIBITORS FOR CLOSED COOLING SYSTEMS OF DIESEL ENGINES, by G. R. Garber. 11 May 55, 16p. 2 refs. Evaluation rept. 010162G.
Order from LC mi$2.40, ph$3.30 PB 148 704

A 1,000-hour laboratory test of corrosion inhibitors for closed cooling-water systems of naval diesel engines has been completed. Alkaline-chromate inhibitor containing phosphate gave best protection under the conditions of test. (Author)

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
CORROSION OF WELDED ALUMINUM ALLOYS IN INHIBITED RED FUMING NITRIC ACID, by M. S. Orysh, L. L. Gruss, and A. Gallaccio. Jan 60, 77p. 37 refs. Technical rept. R-1524.
Order from LC mi$4.50, ph$12.30 PB 147 905

An investigation was conducted to determine the resistance of six welded aluminum alloys to corrosion by inhibited red fuming nitric acid (IRFNA) for 40, 100, 180, and 360 days at -30°, 80°, 114°, and 150° F. The corrosion of the welded alloy combinations exposed to IRFNA progressed with time except when exposed at -30°F. The tensile strengths of the welds and base materials were not adversely affected by contact with IRFNA for the duration of one year at the temperatures investigated. The corrosion rates of the 3003/1100 and 5052/5052 combinations increased, whereas that of the 2014/4043 combination decreased as the water concentration of the IRFNA was increased to 7.5 percent.

[RIAS, Inc., Baltimore, Md.]
INVESTIGATION OF THE FRACTURE OF METALS, by I. R. Kramer. Final rept. on Contract Nonr-2616(00). 31 July 59, 22p. 21 refs.
Order from LC mi$2.70, ph$4.80 PB 147 077

The delay time for the initiation of plastic flow was studied in single crystals of aluminum, iron and zinc. The delay time of aluminum was found to be affected by pre-strain and orientation. Values for the "activated" volume are too small to be interpreted in terms of forest dislocation. The activated energy is found to vary with pre-strain. For iron, the activated energy compared favorably with values calculated from Cottrell's equation. The presence of nitrogen in zinc is found to increase the delay time. (Author)

Watertown Arsenal Labs., Mass.
NOTCH SENSITIVITY AND LAMINATED CHARPY IMPACT STRENGTH OF 1100-F AND 2024-T4 ALUMINUM ALLOY SIMULATED SHEET, by S. V. Arnold. Sep 59, 21p. 3 refs. WAL TR 341.5/1; AD-225 559.
Order from OTS $0.75 PB 151 898

Simulated sheet of 1100-F and 2024-T4 aluminum alloys were fashioned in 0.050, 0.080, 0.100, 0.133, and 0.200-inch gages by removing equal amounts of stock from each rolled surface of 0.250-inch plate. Laminated Charpy specimens 0.400-inch thick were assembled from this simulated sheet and tested over the range -196° to 400°C. Notched and unnotched tensile specimens were tested at room temperature. (Author)

Watertown Arsenal Labs., Mass.
TEMPERATURE GRADIENT: HARDNESS TECHNIQUE FOR DETERMINATION OF RECRYSTALLIZATION TEMPERATURE, by Joseph M. Dhosi and Marvin B. Pierson. May 60, 22p. WAL TR 831.1/1.
Order from OTS $0.75 PB 161 473

A technique was developed by which recrystallization temperature of alloys can be determined rapidly and with satisfactory accuracy. A 6" - 7" bar of the alloy is heated for a specific time in a specially designed gradient furnace and cooled. A hardness survey is then made along the bar and this is cross-plotted against the temperature gradient to which it had been subjected. The temperature at that point of the bar where hardness values fall off abruptly is then designated as the recrystallization temperature. (Author)

Watertown Arsenal Labs., Mass.
TITANIUM- 6% ALUMINUM - 4% VANADIUM ALLOY: EFFECT OF SPONGE PURITY, ALUMINUM CONTENT AND HEAT TREATMENT, by L. S. Croan, F. J. Rizzitano, and W. L. Warner. Sep 59, 42p. 1 ref. WAL TR 405.21/1; AD-226 305.
Order from OTS $1.25 PB 151 995

An investigation was undertaken to determine the heat treating characteristics of the 6%Al-4%V titanium alloy; the solution and aging temperatures for optimum strength properties; and the effect of varying the aluminum and the interstitial contents on the heat treatment for optimum strength. The study involved the 6%Al-4%V titanium alloy made with three hardness levels of sponge (140, 160, 180 BHN) and three levels of aluminum (6%, 7%, 8%) made with the 140 BHN sponge. A fourth alloy of interest, 5%Al-3%FeCr-3%FeMo (140 BHN sponge) was included in the study. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Defense Atomic Support Agency, Washington, D. C.
CRYSTALLINE NUCLEUS, by Warren W. Nicholas. Techical analysis rept. 17 June 59, 30p. 8 refs. DASA-527; AD-225 170.
Order from LC mi$2.70, ph$4.80 PB 148 379

The hypothesis that nuclear protons and neutrons are located on alternate corners of a cubic lattice is found to explain asymmetric fission, spins and magnetic dipole moments of some of the lightest nuclides, certain features of mass defect in light nuclides, and the magic numbers. Several features of the radioactive series are accounted for. Definite structures are proposed for U^{238}, Pb^{208}, and some of the lighter nuclides. (Author)

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
THE LATERAL DISTRIBUTION OF PENETRATING PARTICLES IN COSMIC RAY EXTENSIVE AIR SHOWERS, by James Arthur Earl. Doctoral thesis. Technical rept. no. 70 on Contract Nonr-1841(16) and National Science Foundation Grants G2055 and G3006. 31 Aug 59, 91p. 22 refs. AD-226 648.
Order from LC mi$5.40, ph$15.30 PB 147 713

The penetrating component of extensive air showers detected by the MIT air shower experiment at Harvard, Massachusetts, was observed with the aid of a large hodoscope shielded by 985 g/cm^2 of lead. The number of electrons, core location, and arrival direction of each shower were given by the air shower experiment. Mu-mesons associated with a shower could be identified by requiring the projected zenith angle as measured by the hodoscope to agree with the known arrival direction of the shower. An auxiliary detector consisting of a single heavily shielded tray of counters was operated 920 m from the center of the array. In showers with zenith angles less than 25° the density of mu-mesons is proportional to $r^{-1.0 \pm .2}$ for r between 20 and 150 m. (r is the distance from the shower core to the meson detector.) For r between 200 and 900 m the density is proportional to $r^{-2.2 \pm .1}$. The shape of the lateral distribution changes as the zenith angle of the showers is increased. The nature of this change is such that the mesons in inclined showers are more spread out than those in vertical showers. The effect of the magnetic field of the earth on the lateral distribution is small. The meson density near the core is proportional to $Ne^{-79 \pm .05}$ where Ne is the number of electrons in the shower. For showers with a constant observed number of electrons, the meson density near the core does not change with zenith angle. (Author)

Elementary Particles

Lockheed Aircraft Corp., Marietta, Ga.
EPI-THERMAL DOSE AND ATOMIC PRODUCTION CALCULATIONS, by Walter R. Burrus. Rept. on Contract AF 33(600)32055. Jan 60, 47p. 13 refs. Nuclear rept. 40R; AD-207 003.
Order from LC mi$3.30, ph$7.80 PB 148 381

The cross sections for energy absorption were determined for several common elements as a function of energy, and average cross sections were calculated for each of 3 representative reactor neutron spectra. These average cross sections vary for different spectra, but the variations for the representative spectra selected were no larger than a factor of 2. Most of the cross sections vary from spectra to spectra in the same general manner, so comparison of one cross section with another is much more accurate that the determination of absolute value of the average cross section. The conversion of integral flux ϕ (E) (flux above energy E) to total energy flux is determined for each of the 3 representative spectra. The fraction of the absorbed dose effective in producing atomic displacements was computed for several common metals. It may be multiplied by the absorbed energy to give the energy used in formation of atomic displacements. This 2-step calculation has an advantage over a direct calculation of the number of atomic displacements in that the result is completely insensitive to the critical ionizing energy. If the displacement energy is known, the number of atomic displacements may be found by dividing the energy used in atomic displacement production by the average energy required to produce one atomic displacement, about twice the displacement energy. (Author)

Maryland U., College Park.
ABSORPTION MECHANISMS OF NEGATIVE K MESONS AND PIONS IN LIQUID HYDROGEN, by Thomas B. Day. Rept. on Contract AF 49(638)24. Apr 60, 19p. 10 refs. Physics Dept. Technical rept. no. 175; AFOSR-TN-60-501.
Order from LC mi$2.40, ph$3.30 PB 147 740

Pittsburgh U., Pa.
TIME-INDEPENDENT NON-RELATIVISTIC COLLISION THEORY, by E. Gerjuoy. Technical rept. no. 4 on Capture-Loss and Ionization Cross-Sections of Ions and Neutral Particles, Contract Nonr-624(06). Dec 57, 61p. 21 refs.
Order from LC mi$3.90, ph$10.80 PB 138 206

Arbitrarily complicated rearrangement collisions describable by the time-independent non-relativistic Schrodinger equation are treated in a wholly time-independent framework, without explicit reference to transition probabilities. Introducing a generalized probability current operator for many-particle systems, the current flow at large distances can be computed in complete analogy with one-particle scattering. This procedure leads to the same formal expressions for reaction rates as are obtained from more conventional formulations.

Texas Nuclear Corp., Austin.
ELASTIC AND INELASTIC SCATTERING OF 4.1 MEV NEUTRONS FROM Ca, Mo, Sb, AND Hg, by Lloyd D. Vincent, Ira L. Morgan and J. T. Prud'homme. Rept. for 15 Mar 59-18 Feb 60 on Contract AF 33(616)5619. Apr 60, 64p. 51 refs. WADD TR-60-217.
Order from OTS $1.75 PB 161 807

An investigation of the interaction of 4.1 Mev neutrons with calcium, molybdenum, antimony, barium, and mercury has been performed. The following determinations have been made: the angular distribution of the elastically scattered neutrons from Ca, Mo, Sb, Ba, and Hg; the angular distribution of the inelastically scattered neutrons form Mo, Sb, Ba, and Hg; energy distributions at 90^{0} for Ca, Mo, Sb, Ba, and Hg; nuclear temperatures for the residual nucleus of Mo, Sb, Ba, and Hg; total, elastic, and non-elastic cross sections for Ca, Mo, Sb, Ba, and Hg. (Author)

Instruments and Installations

Battelle Memorial Inst., Columbus, Ohio.
EXPERIMENTAL AND RESEARCH WORK IN NEUTRON DOSIMETRY, by J. E. Drennan and C. S. Peet. Quarterly progress rept. no. 1, 15 May-15 Aug 59, on Contract DA 36-039-sc-78924. 15 Aug 59, 10p. 6 refs. AD-228 397.
Order from LC mi$1.80, ph$1.80 PB 147 980

Processing techniques for the preparation of wide-base conductivity-modulated, silicon-diffused rectifiers are used for the preparation of a set of experimental units. These techniques provide a base from which any modifications can be made. A statistically designed experimental program was initiated which should be useful for determining the optimum geometry and forward voltage for the conductivity-modulated silicon diode used in neutron dosimetry. The program should also provide necessary information for the design of associated measurement circuitry. Theoretical and experimental investigations pertaining to the physical phenomena involved in the rectifier were initiated. (Author)

Battelle Memorial Inst., Columbus, Ohio.
EXPERIMENTAL AND RESEARCH WORK IN NEUTRON DOSIMETRY, by J. E. Drennan, A. R. Zacaroli and others. Quarterly progress rept. no. 2, 15 Aug-14 Nov 59, on Contract DA 36-039-sc-78924. 15 Nov 59, 39p. 17 refs. AD-233 429.
Order from LC mi$3.00, ph$6.30 PB 147 981

Modifications in processing techniques were designed to obtain higher initial charge-carrier lifetimes, since the sensitivity of the dosimeter rectifiers to neutron exposure results primarily from a decrease in lifetime. Experiments were carried out to investigate the sensitivity of 2 sets of experimental units to pure gamma radiation and to the fast-neutron radiation in the Battelle Research Reactor. Theoretical investigations were conducted to establish the expected relative sensitivity of the dosimeter rectifiers to gamma, thermal-neutron, and fast-neutron radiation. A study of the device performance characteristics in relation to the practical read-out circuitry possibilities was conducted. The greatest sensitivity of the dosimeter rectifiers will be obtained with base widths of 0.020 in. or greater. There is evidence that gamma radiation in the dose range of practical interest will not affect the dosimeter-rectifier parameters of interest to this application significantly. Theoretical investigations indicate that the dosimeter-rectifier parameters should not be affected appreciably by either gamma or thermal-neutron radiation in the dose range of interest. (Author) (See also PB 147 980)

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
DESIGN OF A DUAL SENSOR GAMMA RAY CALORIMETER, by James R. Coss and Philip B. Hemmig. Rept. for Sep 58-Jan 60 on Materials Analysis and Evaluation Techniques. Mar 60, 17p. 12 refs. WADD Technical note 60-48.
Order from OTS $0.50 PB 161 787

The theoretical and design considerations for the construction of dual sensor gamma ray calorimeter are presented. The advantages of this type of dosimetry over commonly used present day types are pointed out and justified. The small size, high reproducibility, and small expense of this instrument made it a potentially very useful tool for use in radiation effects programs. The differences in equilibrium temperature attained by two slugs, via gamma heating, is measured as a voltage by thermocouples, and this thermocouple voltage correlated to the dose rate. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
RESPONSE OF A LOW-GEOMETRY SCINTILLATION COUNTER TO FISSION AND OTHER PRODUCTS, by P. D. LaRiviere. 4 Feb 59, 26p. 9 refs. Research and Development Technical rept. USNRDL-TR-303.
Order from LC mi$2.70, ph$4.80 PB 148 058

The theoretical response of a low-geometry scintillation counter to any photon-emitting nuclide whose decay scheme is known is developed. It is used to compute the counting rate, as a function of time, of (1) individual and total fission products resulting from 10^{4} simultaneous slow-neutron fissions of U^{235} and (2) several other nuclides for 10^{4} initial atoms. The calculations extend from $\sim$45 min to 301 days after fission. (Author)

Nuclear Engineering and Power

Avco-Everett Research Lab., Mass.
MAGNETOHYDRODYNAMIC POWER GENERATION USING NUCLEAR FUEL, by Richard J. Rosa. Mar 60, 21p. 11 refs. Research rept. 87; AD-234 568.
Order from OTS $0.75 PB 161 824

A brief review is given of the basic theory of magnetohydrodynamic (MHD) power generators. The basic electrical properties of gases are reviewed briefly. Overall performance characteristics of MHD generators are presented as a function of these gas properties. This gives an indication of the future potential of MHD as a conversion technique. An experimental MHD generator which was built at the Avco-Everett Research Laboratory is described and its performance discussed. MHD power plant cycles are discussed. A cycle designed for use with a nuclear reactor is described. Some of the possibilities for the future are discussed in which more exotic forms of high temperature reactor combined with an MHD generator may make possible nuclear powered systems having, by present standards, very low cost, high efficiency, and/or light weight. (Author)

Naval Research Lab., Washington, D. C.
NEUTRON FLUX MEASUREMENTS FOR MATERIALS IRRADIATION EXPERIMENTS AT ARGONNE NATIONAL LABORATORY, BROOKHAVEN NATIONAL LABORATORY, OAK RIDGE NATIONAL LABORATORY, AND NATIONAL REACTOR TEST STATION, by L. E. Steele and J. R. Hawthorne. Interim rept. 23 May 60, 11p. 3 refs. NRL rept. 5483.
Order from OTS $0.50 PB 161 456

In studies of the effects of nuclear radiation upon the properties of steel, a continuous effort has been made to measure accurately the neutron-flux density and energy spectrum in four research reactors. Such measurement, made with various dosimeter materials, have determined which reactor facility provides the desired nuclear environment, and have served as necessary parameters in assessing mechanical property changes in irradiated steels. Flux surveys for all reactor experiments were limited to threshold detectors with nuclear and physical characteristics suitable for extended reactor exposure under varying environmental conditions. These monitors, cobalt, cadmium-shielded cobalt, nickel, and sulfur, were utilized in flux measurements. The neutron-flux data for high-flux positions in these four research reactors show a high-degree of correlation with changes in materials properties after irradiation.

Nuclear Reactions

Miami U., Coral Gables, Fla.
STUDY OF ANTIPROTON INTERACTIONS, by M. Blau, C. F. Carter, and A. Perlmutter. Rept. on Contract AF 49(638)97. 31 Mar 60, 17p. 6 refs. AFOSR-TN-60-461.
Order from LC mi$2.40, ph$3.30 PB 147 786

The work described in this report is a compilation of data obtained from the exposure of a stack of 200 Ilford G5 emulsions, of dimensions 4" x 6" x 400 μ, to a separated beam of 670 $\frac{Mev}{c}$ antiprotons.

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
ANALYTIC WAVE FUNCTIONS III. THE SPIN-ORBIT, SPIN-OTHER ORBIT AND SPIN-SPIN INTERACTIONS, by R. G. Breene, Jr. Rept. on Contract AF 04(647)269. 26 Apr 60, 19p. 7 refs. Technical Information Series R59SD414 (Revised); Supersedes PB 144 190.
Order from LC mi$2.40, ph$3.30 PB 147 522

In two earlier papers methods and programs have been described for calculations of certain classes of atomic wave functions. This paper considers the application of the wave functions so obtained to the calculation of the spin-orbit, spin-other, and spin-spin interactions.

Radioactivity

Naval Research Lab., Washington, D. C.
STUDY OF COKE-AGGREGATE CONCRETE AS A SHIELD TO ELECTROMAGNETIC RADIATION, by P. F. Nicholson. Interim rept. 6 May 60, 11p. NRL rept. 5473.
Order from LC mi$2.40, ph$3.30 PB 145 522

The electromagnetic behavior of a coke-aggregate concrete as a shield to radiation has been investigated. Measurements have been taken on a sample within the frequency range from 1 to 1000 Mc. The loss-versus-frequency characteristic can be predicted with reasonable accuracy by the adaptation of classical propagation theory to the transmission of electromagnetic waves through an imperfect conductor. With a knowledge of the approximate value of complex permittivity and a measurement of direct-current conductivity, substitution of these parameters into a general equation will then yield the total insertion loss at the desired frequency. (Author)

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON SEMICONDUCTOR MATERIALS, by F. J. Reid, J. W. Moody, and R. K. Willardson. Rept. on Contract AF 33(616)5171. 20 Dec 57, 48p. 44 refs. REIC rept. no. 1; AD-147 399
Order from LC mi$3.30, ph$7.80 PB 147 101

A literature survey is presented on radiation effects in semiconductor materials. Results indicate that Ge is relatively radiation resistant. For 1 to 30 ohm-cm Ge the minority-carrier lifetime and the conductivity begin to be affected at about 10^{11} fast neutrons/sqcm. Less pure Ge(< 1 ohm-cm) gives greater radiation resistance. Si appears to be less radiation resistant than Ge by as much as a factor of 2.

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON SEMICONDUCTOR MATERIALS (FIRST ADDENDUM) by L. W. Aukerman. Rept. on Contract AF 33(616)5171. 31 Mar 59, 36p. 116 refs. REIC rept. no. 1 (Addendum); AD-210 758.
Order from LC mi$3.00, ph$6.30 PB 147 101-S-1

The literature on the effects of high-energy-radiation semiconductor materials received by the Radiation Effects Information Center during 1958 and 1959 has been reviewed and compared. The materials covered are germanium, silicon, and several compound semiconductors including indium antimonide, gallium antimonide, indium arsenide, aluminum antimonide, and gallium arsenide. All types of irradiation capable of producing permanent damage are considered. A rather serious discrepancy between theory and experiment appears to be present in most cases investigated. (Author) (See also PB 147 101)

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON STRUCTURAL METALS, by B. C. Allen, A. K. Wolff and others. Rept. on Contract AF 33(616)5171. 31 May 58, 43p. 62 refs. REIC rept. no. 5; AD-157 170.
Order from LC mi$3.30, ph$7.80 PB 147 103

This report presents the state of the art on the effects of nuclear radiation on structural metals from 1943 through 1957. The general effects of various types of radiation on metals are discussed and the damage mechanisms are outlined. Following this is a topical discussion of the effects of fast neutrons on the physical and electrical properties and corrosion resistance of metals. Tabular data are presented on these effects. Experimental evidence to date indicates that structural metals are quite resistant to nuclear radiation when compared to such things as organic compounds or electronic components. Fast neutrons in integrated flux levels above 10^{19} nvt represent the only reactor radiation that can significantly affect the properties of structural nonfissionable metals. (Author)

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
SURVEY OF IRRADIATION FACILITIES (FIRST ADDENDUM) by J. F. Kircher and J. L. McFarling. Rept. on Contract AF 33(616)5171. 15 Feb 59, 66p. 14 refs. REIC rept. no. 7 (Addendum); AD-210 767.
Order from LC mi$3.90, ph$10.80 PB 139 042 S-1

This report is an addendum to REIC Report No. 7 (PB 139 042) and contains brief descriptions of reactor facilities completed in the past years, those under construction, and those in the planning stage. Additional gamma facilities are listed also. (Author)

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Arctic Aeromedical Lab., Ladd AFB, Alaska.
COLD WEATHER EVALUATION OF PROTECTORS, EAR, SOUND, TYPE PRU-1/P AND HELMET, SOUND PROTECTOR ACCOMMODATING, TYPE HGU-1/P, by Norman C. Van Tassel. May 59, 9p. Technical note AAL-TN-59-1; AD-230 841.
Order from LC mi$1.80, ph$1.80 PB 146 120

The HGU-1/P helmet and PRU-1/P ear protector were evaluated for use with the AF parka hood in arctic weather. The wool-backing helmet was designed to accommodate the ear protectors. The ear protectors consist of close-fitting muffs held in place over the ears by an adjustable headband. Tests indicated that the helmet and ear protector are compatible for wear with the AF parka hood. Of the 5 individuals who evaluated the helmet, 3 stated it provided adequate thermal protection at -40°F, one at -5°F, and one at 0°F. The design of the helmet and ear protector was considered satisfactory. Low-frequency sounds or (Personnel Supplies and Personal Equipment, speaking tones can be heard while wearing the helmet and ear protector. Helmet and protector did not cause any undue discomfort to the user.

Army Chemical Warfare Labs., Army Chemical Center, Md.
PHYSIOLOGICAL EVALUATION OF THE E52R26 CIVILIAN PROTECTIVE MASK, by E. G. Cummings, F. N. Craig, and W. V. Blevins. Nov 59, 26p. 14 refs. CWLR-2323.
Order from LC mi$2.70, ph$4.80 PB 146 458

Air-flow measurements by the new Gulton transducer and pressure measurements resulted in inspiratory resistance of 0.5 mm H_2O/l/min at flows of 85 l/min and expiratory resistances of 0.2 mm H_2O/l/min. Dead space, measured by continually monitoring mask CO_2 and flow, varied from 0.35 to 0.55 l, depending upon the tidal volume. The E52R26 mask does not impose excessive physiological stress on the wearer in environments tested for periods of 1 hr and under light exercise conditions. In environmental temperatures below 40°F, fogging was severe, necessitating the use of the antidim cloth in order to produce good visibility. Indications are that lens frosting may produce poor visibility when the mask is worn at temperatures below freezing. If the filter pads absorbed over 20 g, breathing became difficult, thus shortening the wearing time. In a moderate to heavy natural rain, the mask can be worn for an hour without difficulty. However, in torrential downpours (3.7 in./hr), the maximum mask-wearing time was 20 to 25 min, because of high resistance.

Quartermaster Research and Engineering Center, Natick, Mass.
AUXILIARY HEATING SYSTEMS FOR COMBAT CLOTHING, by Leo A. Spano and Theodore L. Bailey. July 59, 67p. 15 refs. Technical rept. QMRE-20 (APO-1); AD-226 500.
Order from LC mi$3.90, ph$10.80 PB 146 126

Findings revealed that: (1) auxiliary heating systems for the inactive or moderately active soldier operating in cold-dry climates are needed to compensate for the heat debt experienced by individuals clothed in the present 4.3 Clo cold-dry ensemble; (2) protection of the hands and face is presently a serious and urgent problem; (3) protection of the feet, although serious, is not as critical as that of the hands and face; and (4) no present standard combat clothing system provides or even approaches the protective requirements stipulated by the approved military characteristics covering cold-dry body clothing, handwear, footwear, and headgear. A program was undertaken to (1) develop and evaluate auxiliary heating systems for rewarming troops that have been exposed to deep cold; (2) develop auxiliary heating devices and systems for the extremities to increase the combat-effective time a soldier can be exposed to extreme cold environments; and (3) to design and develop a combat clothing ensemble provided with an integral auxiliary heating system to keep the wearer combat-effective at all times when operating in extremely cold climates.

PHYSICS

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
BUCKLING OF CLAMPED SHALLOW SPHERICAL SHELLS, by Bernard Budiansky. Technical rept. no. 5 on Contract Nonr-1866(02). Aug 59, 44p. 16 refs. AD-225 640.
Order from LC mi$3.30, ph$7.80 PB 147 719

This paper is concerned with the axisymmetric buckling under uniform pressure of a shallow portion of a spherical shell, clamped along a circular boundary. The present analysis, which exploits an integral-equation formulation of the problem, should give results of uniform accuracy for all thicknesses.

National Bureau of Standards, Boulder, Colo.
A BIBLIOGRAPHY OF THE PHYSICAL EQUILIBRIA AND RELATED PROPERTIES OF SOME CRYOGENIC SYSTEMS, by Thomas M. Flynn. May 60, 126p. 681 refs. Technical note no. 56.
Order from OTS, $1.75 PB 161 557

A bibliography of approximately 700 references is presented on the physical equilibria and related properties of several important cryogenic systems. The systems considered are the pure components and mixtures of: hydrogen, helium, nitrogen, carbon dioxide, carbon monoxide, methane, ethane, and propane. (Author)

Acoustics

Aeronutronic, Newport Beach, Calif.
STUDY OF INFLUENCE OF SOUND WAVES ON CHEMICAL REACTION RATES, by H. M. Wight. Rept. on Contract AF 49(638)311. 31 Mar 60, 49p. 37 refs. Technical rept. U-858; AFOSR-TR-60-60.
Order from LC mi$3.30, ph$7.80 PB 147 936

Within the general context of exploring possible mechanisms contributing to resonance combustion instability in rocket motors, a study has been made of the interaction of sound waves and homogeneous gas phase chemical reactions. This has involved two aspects: (1) the enhancement of reaction rates by sound waves, and (2) the amplification or absorption of a traveling sound wave by a gas phase reaction. Theoretical analysis relating to (1) and (2) indicate that gas phase enhancement and amplification are not expected to be mechanisms of major importance contributing to resonance. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
ON THE PROPAGATION OF ACOUSTIC WAVES IN GASES AT HIGH TEMPERATURES AND REDUCED PRESSURES, by G. L. Vick. Technical rept. 30 June 59, 31p. 16 refs. LMSD-49762; AD-228 429.
Order from LC mi$3.00, ph$6.30 PB 147 679

Thermodynamic theory is reviewed, as it applies to the propagation of acoustic waves in gases at elevated temperatures and reduced densities. The results of this study establish the applicability of acoustic methods to the measurement of gas temperature and to research on vibrational relaxation, dissociative relaxation, and viscosity phenomena under high temperature, low density conditions. It is concluded that acoustic waves will be propagated with a dispersion of less than $a/a_o = 1.1$ at frequencies below 1 mc at a temperature of 5000°K. Viscosity effects become predominant above 1 mc, resulting in greatly increased dispersion. Two absorption peaks occur at frequencies lower than 0.1 mc corresponding to vibrational and dissociative relaxation. This study of dispersion and absorption indicates that the velocity of acoustic waves may be reliably used as a measure of gas temperature at frequencies below 1 mc. This could have wide application for shock-tube instrumentation. Measurements of acoustic attenuation below 0.1 mc would yield information concerning vibrational and dissociative relaxation. Viscosity effects may be studied from acoustic wave velocity data at frequencies above 1 mc. (Author)

Watertown Arsenal Labs., Mass.
ULTRASONIC METHODS FOR NEAR-SURFACE FLAW DETECTION, by Otto R. Gericke. Nov 59, 16p. 5 refs. WAL TR-143/33; AD-229 387.
Order from OTS $0.50 PB 161 048

In order to detect near-surface defects, either extremely short ultrasonic pulses or an artificial pulse delay are required. The objective of the work covered by this report was to investigate the possibilities of pulse delay, and develop methods which can be used for practical applications. Three of the procedures which are discussed show promising experimental results. Defects as close as 0.015" to the test surface can be detected, although fairly long pulses of 3 to 10 microseconds duration are used. (Author)

Electricity and Magnetism

Arizona U. [Tucson].
ELECTRICAL AND SPECTRAL CHARACTERISTICS OF HIGH CURRENT SPARK DISCHARGES, by Leon Blitzer. Final rept. for 20 Feb 56-28 Feb 59 on

Contract DA 04-495-ORD-434. [1959] 27p. 10 refs.
OOR rept. 786-...; AD-217 573.
Order from LC mi$2.70, ph$4.80 PB 147 592

A study was made of the electrical and spectral characteristics following breakdown of high-current condensed spark discharges. The discharge current was found to be very nearly the same as in an ordinary LCR circuit. Gap voltages in all cases were observed to fall from initial high values (3.5-6.0 kv) to about 50 v in about 1.0 μsec and to decrease thereafter linearly with time. The gap resistance was found to be very small compared to the resistance of the remainder of the circuit. In general, the electrical parameters were little affected by the material of the electrode. From relative intensities of spectral lines of Fe I, Ni and Ti II a study was also made of excitation temperatures in the discharge column. In all cases the relative line intensities were consistent with a Boltzmann distribution of the atoms among the excited states. Wide variations in temperature during the history of the discharge point led to an absence of any well-defined equilibrium. At the same time no significant differences were observed from one spectrum to another, calculated temperatures being essentially in the region 6000-8000°K both for damped and oscillatory discharges. (Author)

California U., Berkeley.
MATHEMATICAL ASPECTS OF ELECTROMAGNETIC THEORY I, by Bernard Friedman. Technical rept. no. 2 on Contract Nonr-222(60). Aug 59, 65p.
AD-225 473.
Order from LC mi$3.90, ph$10.80 PB 147 699

Problems in the diffraction of electromagnetic waves are discussed as examples of boundary value problems in partial differential equations. Maxwell's equations are first presented and then the Schwartz distribution theory is introduced to show how point, line and surface charge distributions may be represented mathematically. After a short discussion about plane waves and the impedance concept, a derivation is given of the field produced by a line source situated above an impedance plane. (Author)

Case Inst. of Tech., Cleveland, Ohio.
SPIN WAVE CALCULATIONS FOR FERRIMAGNETICS, ANTIFERROMAGNETICS AND FERROMAGNETICS, by Henry Unruh, Jr. Technical rept. no. 3 on Contract Nonr-1141(07). Aug 59, 88p. 21 refs.
AD-229 391.
Order from LC mi$4.80, ph$13.80 PB 147 723

The spin wave dispersion law for simple cubic and body centered cubic crystals of ferrimagnetic materials is derived. The result allows arbitrary g factors, spins, externally applied field and anisotropy fields if their interaction energy with the spins is in the cosine dependent form. If the interaction energy is in the cosine squared dependent form then the externally applied field must lie in the plane determined by the anisotropy fields on the 2 sublattices. Tables giving the integrated results for the specific heat and the deviation of the magnetization from its saturation value are given for a wide range of crystal constants and externally applied fields. (Author)

Geophysical Inst., U. of Alaska, College.
EARTH CURRENT ACTIVITY AT COLLEGE, ALASKA, 1956-1958, by V. P. Hessler and E. M. Wescott. Scientific rept. no. 2 on Contract AF 19(604)3075 and NSF Grant C 4193. Feb 60, 68p. 18 refs. AFCRC-TN-60-293.
Order from LC mi$3.90, ph$10.80 PB 147 513

This report presents 3-hourly scalings of earth current activity for the entire period from January 1956 through December 1958. The data are analyzed for diurnal, seasonal, and yearly averages of activity. There is a pronounced diurnal variation in activity with a maximum at local midnight. The principal direction of the earth current disturbances at College is about N 33° W and is so constant that total activity in mv/km can be determined with sufficient accuracy from N-S records. Earth current activity has a high correlation with magnetic activity and other polar ionospheric phenomena. The average of six monthly correlation coefficients between magnetic daily A figures and earth current average daily mv/km is .948. Thus, the earth currents constitute a useful indicator of ionospheric activity. (Author) (See also PB 142 027)

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge, Mass.
MICROWAVE RESONANCE IN FERROMAGNETIC SYSTEMS AT HIGH-SIGNAL LEVELS, by J. J. Green. Scientific rept. no. 2, Series 2, on Contract AF 19(604)5487. 1 Dec 59, 122p. 48 refs. AFCRC-TN-60-367.
Order from LC mi$6.30, ph$19.80 PB 147 761

A study of ferromagnetic resonance at high-peak powers has been made in a series of rare earth garnets and in several ferrite spinel systems. The results are analyzed on the basis of a theory developed by Suhl and later modified by Schlömann. The onset to saturation observed in polycrystalline materials is in good agreement with the predictions of the modified theory. According to Suhl, the saturation at high-power levels is due to an exponential-type growth of certain spin waves. The line width of the unstable spin waves has been calculated from the slope of the saturation curve at high-power levels. The presence of rare earth impurities in YIG or cobalt in nickel ferrite leads to a rapid increase in the spin wave line width. This increase can be understood on the basis of a recent theory by Kittel. It has been observed that porosity does not affect the spin wave line width. Experiments on thin rods lead to the conclusion that the spin wave line width in YIG is a rapidly increasing function of k at X band. Numerous measurements of a fine structure in the saturation curves in YIG single crystals gave results which are in good agreement with a theory proposed by Schlömann. Investigations of single crystal GdIG revealed an anisotropy of the spin wave line width comparable to the anisotropy of the uniform mode line width. In nickel ferrite, the addition of zinc results in an increase in magnetization and a transition in the cause of resonance saturation from one type of spin wave to another.

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
EFFECT OF NEUTRON BOMBARDMENT ON THE MAGNETIC PROPERTIES OF IRON AND NICKEL OF VERY HIGH PERMEABILITY. III, by Giuseppe Biorci, Andrea Ferro, and Giorgio Montalenti. Final rept. (3b) on Contract AF 61(514)1331. Feb 60, 66p. 42 refs. AFOSR-TR-60-66.
Order from LC mi$3.90, ph$10.80 PB 147 502

Several ring specimens of Cioffi-type iron and of very pure nickel have been prepared to measure the effects of neutron bombardment on the magnetic properties (magnetization curve and hysteresis loop). By proper heat treatments in hydrogen we have obtained maximum permeabilities of the order of 150.000 in iron and 5.000 in nickel. The irradiation has been made with large doses of fast neutrons (integrated flux of about 10^{19} n/cm^2 nvt). No remarkable variations in the magnetic properties of nickel have been observed after irradiation. The iron specimens have been examined before and after irradiation at fields (up to 150.000 A/m). In the region from 1.000 A/m up no appreciable variation has been observed in the curve of approach to saturation. At low fields the iron samples show a remarkable increase of coercive force and a relevant decrease (about 30%) of the maximum permeability. The conclusion is that the irradiation produces also some defects stable at room temperature whose size (or range of influence) are of the order of, or larger than, 1000 A. (See also PB 146 436)

Lockheed Aircraft Corp., Palo Alto, Calif.
THE MAGNETIZATION REVERSAL AND MICROWAVE RESONANCE PROGRAM DURING 1958, by R. W. Moss, C. F. Kooi and others. 26 Dec 58, 42p. 14 refs. LMSD-48359.
Order from LC mi$3.30, ph$7.80 PB 147 666

This program aims at the determination of the magnetization reversal mechanism in high-speed computer ferrites. The mechanisms, domain wall motion and domain rotation, depend on the damping parameter in different ways. Measurement of the damping parameter by microwave resonance means and by switching experiments shows that wall motion is the preferred mechanism in weak switching fields. This report also describes the experimental apparatus and the method of approach to the problem. (Author)

Maryland U., College Park.
NON-LOCAL CURRENT-FIELD RELATIONSHIP IN METALS, by John L. Warren (Doctoral thesis) and Richard A. Ferrell. Rept. on Contract Nonr-1797(00). Aug 59, 18p. 11 refs. Physics Dept. technical rept. no. 150; AD-229 341.
Order from LC mi$2.40, ph$3.30 PB 148 180

Chamber's formula for the response of the conduction electrons of a metal to an internal transverse electric field is supplemented by a diffusion current when it is used for longitudinal fields. A new derivation of Chambers' formula is given by means of the Boltzmann transport equation, and the additional diffusion term in the current is exhibited explicitly. (Author)

Pennsylvania U., Philadelphia.
THE MEASUREMENT OF MAGNETIC LOSSES BY ROTATING FIELD AND BY ROTATING SAMPLE EXPERIMENTS. by K. Atkins, H. Callen and others. Technical rept. no. 2 on Contract Nonr-551(28). [1959] 21p. 8 refs. AD-225 111 and AD-225 761.
Order from LC mi$2.70, ph$4.80 PB 147 601

Two types of experiments, designed to measure the intrinsic rotational damping in ferromagnetic materials, are discussed. The first type measures the mean angular deviation of the magnetization vector from the direction of a large applied magnetic field when the sample is rotated. The second type measures the torque on the sample when the sample is stationary but the applied magnetic field rotates. Analysis of these experiments sheds light on the physical basis of the dynamical equation, and particularly of the Landau, Lifshitz and Gilbert equations, which are equivalent in stationary-sample experiments for small damping. It is shown theoretically, and corroborated experimentally, that the losses in ferrites are too small to make a rotating sample experiment feasible with ferrite materials. A rotating sample experiment with thin metallic disks or films is theoretically feasible with the experimental set-up. (Author)

Electronics

Aerojet-General Corp., Azusa, Calif.
A SEARCH FOR THE IONIZATION OF H_2 ON DIFFUSION THROUGH Pd, by J. R. Radbill and R. J. Sunderland. Rept. on Contract AF 49(638)214. Feb 60, 20p. 26 refs. Aerojet rept. TN-34; AFOSR-TN-60-426.
Order from LC mi$2.40, ph$3.30 PB 147 505

A search has been made to detect the ionization of hydrogen through palladium. Using as a source a 0.005-in. palladium foil maintained at 1000°K, the mass spectrum of the emission has been determined, with and without the diffusion of hydrogen. Ions corresponding to singly charged Na^{23}, K^{39}, and K^{41} were detected with the Na^{23} mass peak predominating. No other ions were found within the mass range capability (1-240 amu) of the magnetic fields used. Our results indicate that the individual ion current densities at the emitter, due to thermally ionized hydrogen atoms or molecules, must be less than 10^{-9} amp/cm^2. (Author)

Battelle-Institut E. V., Frankfurt-am-Main (West Germany)
THEORETICAL INVESTIGATION AND DESIGN STUDIES FOR THE EVENTUAL CONSTRUCTION OF A MEASURING DEVICE IN THE FIELD OF PLASMA ELECTRONICS. Annual rept. no. 1, 1 Dec 58-30 Nov 59, on Contract DA 91-591-EUC-1018. 31 Dec 59, 22p. 18 refs. AD-230 772.
Order from LC mi$2.70, ph$4.80 PB 146 043

Contents:
Theoretical studies
Studies on the possibility of measuring the properties of plasma
Studies on the properties of the ionosphere
Examination of errors in the location determination of bodies

Possibilities for the technical representation of the correction values.
Planning of experiments for the measurement of the properties of plasma
Cavity resonator method
Phase method
Experimental studies
Preliminary test for the frequency control
Preliminary tests for the plasma investigations
Test method by application of electromagnetic waves passing through a plasma

Chalmers U. of Tech. (Sweden).
THE INFLUENCE OF THE ELECTRON VELOCITY DISTRIBUTION ON SPACE CHARGE WAVES, by Olof E. H. Rydbeck and K. H. B. Wilhelmsson. Rept. no. 3 on Contract AF 61(052)159. [1959] 26p. 3 refs. Research rept. no. 1, 1959; AFCRC-TN-60-352.
Order from LC mi$2.70, ph$4.80 PB 147 509

The purpose of this paper is to study the influence of an electron velocity distribution upon the wave propagation properties of electron beams with special regard to modern space charge wave amplifiers. The velocity distribution considered is the simplest possible one, namely a pulse of certain width and constant amplitude.

Chalmers U. of Tech. (Sweden).
OSCILLATORY PROPERTIES OF GYROMAGNETIC ELECTRONIC COLD PLASMAS WITH DRIFT MOTION. A STUDY OF CIRCULARLY BOUNDED AND INFINITELY EXTENDED MEDIA INCLUDING THE INFLUENCE OF COLLISIONS, by Hans Wilhelmsson. Rept. no. 4 on Contract AF 61(052)159. June 59, 46p. 23 refs. Research rept. no. 2, 1959; AFCRC-TN-60-353.
Order from LC mi$3.30, ph$7.80 PB 147 510

The result of a recent work by O. E. H. RYDBECK [1944] shows that radiation can be produced when space charge waves are carried by an electron beam through an ionized medium. The purpose of the present paper is to extend the treatment of the earlier publication by considering the influence of collisions. The collisional effects are described by means of effective collisional frequencies which are assumed different for the drifting electrons and for the electrons without drift motion. As in the previous investigation special attention is paid to the influence of the drift LORENTZ terms and of the relativistic corrections. Although the calculations, especially in the relativistic case, give rise to a considerable number of terms, the final expressions have a neat and concise form. The result of the investigation is that although the collisions affect the dispersion relations, the same types of waves will be excited under the same excitation conditions as in the absence of collisions. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
THERMIONIC THEORY AND TECHNIQUE, by John Cobb, William Cutler, and Anthony F. Dugan. Technical memo. Sep 59, 25p. 2 refs. LMSD-311695. AD-226 847.
Order from LC mi$2.70, ph$4.80 PB 147 682

The vacuum diode as a means of producing power by thermionic emission has been studied theoretically with respect to efficiency and power. Experimental results, however, indicate that no simple theory is adequate to predict the effect of interelectrode space charge. The parameters which govern the magnitude of the space charge also affect the specific power and efficiency. A simultaneous analysis of space charge, specific power, and efficiency is required to predict effectively cell performance and to facilitate cell design. If the analysis can be made to agree with the experiment, in general, a large part of the experimental program may be circumvented and more time devoted to the search for basic information concerning thermionic phenomena. This report presents the agreement already achieved between the actual experiment and a theory which embraces the cathode electron effect upon space charge. (Author)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
ELECTROMAGNETIC WAVE PROPAGATION IN THE HIGH TEMPERATURE PLASMAS, by Romayne F. Whitmer. Technical rept. on Contract AF 30(604)1944. 9 Apr 59, 46p. 5 refs. RADC-TN-59-81; AD-214 944.
Order from LC mi$3.30, ph$7.80 PB 147 027

Propagation through high temperature plasmas was studied for 2 different types of high-temperature plasmas. In the first type the electrons are at a relatively high temperature, whereas the ions and neutral particles are at, or near, room temperature. In the second type all the constituents of the plasma are at a fairly high temperature. The high electron temperature plasma can be produced by means of microwave breakdown at electron cyclotron resonance. Electrons receive energy very efficiently from the microwave field and lose energy slowly to the other particles. Hence, the neutral particles and ions remain at a relatively low temperature. The second type of plasma can be produced by means of a shock wave. In the region of the shock front all the particles are at a high temperature. Propagation studies will be performed for both types of high temperature plasmas. However, the propagation measurements reported are limited to the high electron temperature plasma. The microwave measurements include the measurement of attenuation, phase, signal distortion, and harmonic content. Both phases of this program are studied theoretically and experimentally. (Author).

Navy Electronics Lab., San Diego, Calif.
SYMPOSIUM ON TROPOSPHERIC RADIO WAVE PROPAGATION WITHIN THE HORIZON, HELD AT NAVY ELECTRONICS LABORATORY, 30 MARCH-2 APRIL, 1953. 2 Sep 53, 72p. 19 refs. Rept. no. 409.
Order from LC mi$4.50, ph$12.30 PB 148 649

The symposium covered three major topics -- terrain effects, refraction effects, and combined and other effects -- on which papers were presented by participants from the United States and several foreign countries. The present report includes these papers and on edited transcript of the summary session during which the main points of each topic session were reviewed. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
REFLECTION OF ELECTROMAGNETIC WAVES FROM A DIELECTRIC-MAGNETIC MATERIAL TERMINATED BY A HIGHLY REFLECTIVE MATERIAL, by Edward J. Calucci. May 60, 25p. 3 refs. RADC-TN-60-25.
Order from LC mi$2.70, ph$4.80 PB 147 850

A method is described for approximating the magnitude of electro-magnetic energy reflected from a dielectric-magnetic material terminated by a highly reflective material. Equations, sample calculations, and a series of graphs are presented, showing the power-reflection coefficient as a function of thickness for varying dielectric-loss tangents, magnetic-loss tangents, and permeability. (Author)

Tung-Sol Electric Inc., Bloomfield, N. J.
UTILIZATION OF SELF-SUSTAINED ELECTRON EMISSION INVESTIGATION, by B. G. Firth and Warren C. Johnson. Rept. no. 4 (Final) 1 Oct 58-30 Sep 59, on Contract DA 36-039-sc-73051. [1959] 42p.
Order from LC mi$3.30, ph$7.80 PB 147 990

A 5 inch cathode ray tube with MgO cold cathode was made with a spot size 3 to 4 times that in a thermionic cathode tube, and a low beam current of 3 μa, operating at 3,000 volts on all high voltage elements. MgO cathode surface potentials for parallel plates 2 cm sq. and 4 mm apart have been measured in the order of 145-190 volts for plate potentials of 151-211 volts. Magnetic analysis of electron energy distribution from the MgO cathode showed a peak at 13.5 volts and 90 per cent of electrons less than 65 volts. Cold cathode emission starting and sustaining, cathode testing, and cathode current characteristics are discussed. Tests on secondary emission preamplifiers indicate that control of secondary emission rather than primary emission may be a promising method of improving both transconductance and frequency response of cold cathode tubes. A cold cathode dynatron oscillator was made to operate up to and beyond 20 mc with sufficient power and voltage for a local oscillator circuit. Audio power amplifier tubes Type DT-812B have been made to operate with dynamic Gm = 600 μmhos and 900 milliwatts audio output at tolerably low noise level and harmonic distortion. Cathode temperatures were measured within an accuracy of a few per cent by checking the resistance of the inactive heaters in them. (See also PB 147 988)

[Willow Run Labs.] U. of Michigan, Ypsilanti.
PREDICTION AND FILTERING FOR RANDOM PARAMETER SYSTEMS, by Frederick J. Beutler. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. June 58, 24p. 16 refs. 2144-259-T; AD-202 607.
Order from LC mi$2.70, ph$4.80 PB 145 972

An investigation was conducted in order to generalize the Wiener-Kolmogorov theory of optimum linear filtering and prediction of stationary random inputs. It is assumed that signal and noise have passed through a random device before being available for filtering and prediction. A random device is a unit whose behavior depends on an unknown parameter for which an a priori probability distribution is given. A number of engineering applications are cited. Two of these are worked out in some detail to illustrate the optimization procedure. (Author)

Molecular Physics and Spectroscopy

Institute of Engineering Research, U. of California, Berkeley.
NEW STUDIES OF MOLECULAR SCATTERING AT THE SOLID SURFACE, by F. C. Hurlbutt and D. E. Beck. Rept. on Contract Nonr-222(45). 11 Aug 59, 36p. 11 refs. Rept. no. HE-150-166; Series no. 20, issue no. 127; AD-228 255.
Order from LC mi$3.00, ph$6.30 PB 148 164

A molecular beam apparatus is used to study the physics of interaction at the gas surface interface. The spatial distributions of the flux of particles scattered from various surfaces are presented. Data is presented for the scattering of Argon atoms and Nitrogen molecules from teflon, glass, cleaved crystals of zinc and lithium fluoride, and liquid metal surfaces of gallium and indium. (Author)

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
FORCE CONSTANT CALCULATIONS IN LINEAR TRIATOMIC MOLECULES FROM INFRARED AND MICROWAVE DATA, by Peter H. Verdier and E. Bright Wilson, Jr. Rept. on Contract Nonr-1866(14). [1959] 6p. 10 refs. AD-211 282.
Order from LC mi$1.80, ph$1.80 PB 146 185

Calculations of the complete quadratic potential energy function were made for the $O^{16}C^{13}S^{32}$ isotope and N_2O by using centrifugal distortion constants from microwave spectra and infrared frequencies. The potential function was $2V = f_{11}r_1^2 + 2f_{12}r_1r_2 + f_{22}r_2^2$, where r_1 and r_2 are the increases in the 2 bond lengths and the f's are the force constants. The sensitivity of the force constants was checked in each case. The sensitivity calculations indicated that corrections of vibrational frequencies to zero amplitude and for Fermi resonance and the use of equilibrium rotation constants (B_e and D_e) rather than observed values can have appreciable effects upon the computed force constants. By judicious choice of corrections to the rotational constant, B, and the stretching frequencies, force constants for N_2O can be obtained which agree with the accepted values to within 15% for the bond stretching constants and 75% for the interaction constant. The sensitivity of the calculated force constants to the value of the rotational constant, D, was determined.

Materials Research Lab., Watertown Arsenal, Mass.
A SIMPLE CORRELATED WAVE FUNCTION, by R. J. Weiss. May 60, 6p. 5 refs. MRL rept. no. 75.
Order from LC mi$1.80, ph$1.80 PB 147 484

A simple correlated ground state wave function for He like atoms is suggested. It has the proper behavior at the singularities and enables several of the observables to be evaluated analytically. (Author)

Minnesota U., Minneapolis.
STRUCTURAL INVESTIGATIONS OF LARGE MOLECULES BY X-RAY DIFFRACTION, by William N. Lipscomb. Final rept. on Contract AF 49(638)485. Oct 59, 4p. 4 refs. AFOSR-TR-60-31.
Order from LC mi$1.80, ph$1.80 PB 147 659

The three-dimensional structure, except for the absolute configuration, has been determined in an X-ray diffraction study of ψ-conhydrine hydrobromide. In agreement with recent chemical evidence, the OH and propyl groups are found to be trans to each other, and in the equatorial position relative to the saturated six-membered ring. The unit cell is orthorhombic in the space group D 4/2-$P2_12_12_1$, contains four $C_8H_{18}NOBr$, and has dimensions a =15.15, b=9.38, c =7.72 A.

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
THEORETICAL AND EXPERIMENTAL STUDY OF MOLECULAR-BEAM MICROWAVE SPECTROSCOPY, by Martin Peter and M. W. P. Strandberg. Rept. on Contract DA 36-039-sc-64637 and Technical rept. no. 1 on Contract DA 36-039-sc-73014, 25 Aug 57, 52p. 42 refs. Technical rept. 336; AD-200 421.
Order from LC mi$3.60, ph$9.30 PB 147 455

A variety of topics that bear directly upon the use of molecular-beam spectroscopic methods for precise frequency determination with the use of alkali-halide molecules are discussed. The rotational-energy spectrum, including resolvable hyperfine structure arising from quadripole and magnetic interactions, is calculated. An analysis of integrated line strength, or intensities, is presented. State selection is discussed in terms of the appropriate high-field Stark effect, for which new calculations are given. State selection with both axial and transverse-rod configurations is discussed, and trajectories for sodium chloride with the use of a transverse-rod state selector are indicated. The limitations of any selector which arise from nonadiabatic losses are analyzed. The design parameters of a microwave spectroscope, including signal-to-noise ratio and ultimate precision, are related to its geometric configuration, and a description of an apparatus that is adequate for high-resolution work is given. Related topics, such as the concept of efficiency of frequency measurements and frequency pulling, are discussed in generalized fashion. Conclusions that can be derived from this work, as to both present limitations and necessary future development, are drawn. (Author)

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE FREE-FREE CONTINUUM OF OXYGEN, by R. G. Breene, Jr. and M. C. Nardone. Rept. on Contract AF 04(647)269. 29 Apr 60, 13p. 7 refs. Technical Information Series R60SD365.
Order from LC mi$2.40, ph$3.30 PB 147 523

Oxygen is treated in an example calculation of the free free absorption cross section. Wave functions for the free electron in the field of an oxygen atom under the assumption of no electron exchange or core polarization are calculated on the IBM 704. These wave functions are applied to the calculation of the free free absorption corresponding to a particular continuum frequency and initial state energy. In this calculation the dipole acceleration form of the matrix element is computed. The matrix element calculation is carried out on the LGP-30. These partial cross sections are smeared over a Maxwell Boltzmann distribution of initial electronic energies in order to obtain the free free cross section. The results are in approximate agreement with the familiar classical Kramers result for an effective $\bar{Z}$ of 0.31. (Author)

Tennessee U., Knoxville.
THE INFRARED SPECTRUM OF HCOF AND DCOF, by Roy F. Stratton, Jr. (Doctoral thesis) and Alvin H. Nielsen. Technical rept. no. 4 on Contract DA 33-008-ORD-1166. 5 Dec 57, 169p. 17 refs. OOR rept. 1505.6; AD-150 592.
Order from LC mi$7.80, ph$25.80 PB 147 862

The absorption spectra of formyl fluoride (HCOF) and deutro-formyl (DCOF) were studied in the gaseous state in the IR region. The gases were studied at room temperature which is essentially in the ground electronic and vibrational state. Nine bands were observed in HCOF and 13 in DCOF. A rotational analysis was completed on 5 of the fundamental bands in each molecule. The moments of inertia were used to determine the approximate position of the H atom. The band centers were used to determine some of the vibrational constants.

Optics

Institute of Optics, U. of Rochester, N. Y.
ASPHERICAL LENS DESIGN AND FABRICATION. Final rept. for 1 June 52-30 Nov 54 on Contract DA 30-115-ORD-358. Dec 54, 172p. 5 refs.
Order from LC mi$8.10, ep$28.80 PB 148 060

Itek Corp., Waltham, Mass.
OPTICAL IMAGE FORMATION IN TERMS OF ENTROPY TRANSFORMATIONS, by E. L. O'Neill and T. Asakura. Final rept. on Contract AF 49(638)577. Apr 60, 34p. 20 refs. Itek P-163; AFOSR-TR-60-63.
Order from LC mi$3.00, ph$6.30 PB 147 851

The intimate relationship of the theory of partial coherence, the matrix approach to image formation, and the application of Communication and Information Theory to optics are presented. It is shown that both matrix and communication approaches flow natural from E. Wolf's general theory of image formation in terms of the mutual coherence function. The matrix and communication approaches themselves are closely related. New results are also presented from both a geometric and physical optics point of view showing the change in entropy loss as a function of focal position. The arguments presented are confined to the case of quasi-monochromatic illumination. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE DIFFRACTION OF RADIATION BY INHOMOGENEOUS LENSES, by Calvin H. Wilcox. 15 Aug 58, 92p. 15 refs. LMSD-5126.
Order from LC mi$5.40, ph$15.30 PB 147 665

The present method is both a generalization and a refinement of the traditional geometrical optics method. The new features of the method are (1) The approximations are deduced directly from the rigorous mathematical formulation of the problem starting with Maxwell's equations. (2) The vector nature of the field, and the associated polarization phenomena, are preserved in the present approximations. (3) Approximations are obtained for the field at any point in space, including those in the "shadow" region of classical geometrical optics (i.e., points that are reached by no light rays).

Massachusetts U., Amherst.
A PHOTOGRAPHIC METHOD FOR THE STUDY OF LIGHT SCATTERED FROM POLYMER FILMS AT SMALL ANGLES, by Alphonse Plaza and Richard S. Stein. Technical rept. no. 13 on Contract Nonr-2151(00). 1 Aug 59, 10p. 10 refs. AD-225 702.
Order from LC mi$1.80, ph$1.80 PB 148 137

An apparatus is described for measuring the scattering of light from films of high polymers at angles of 0^{o} to 10^{o} from the incident beam. The spherulites in polyethylene films are in such a size range that the scattering technique is of value in determining their size, properties, and internal structure. Light from an arc source is rendered parallel with a lens and a pinhole system and monochromatic with filters. A shutter and iris diaphragm serve to define the beam. A polaroid polarizer and analyzer may be inserted when polarization studies are desired. Collimation of the incident beam is such that scattered light down to about 0.3^{o} from the incident beam may be resolved. A maximum in scattering occurs at an angle of about 1.8, and there is a rapid decrease in scattering with increasing angle.

Ramo-Wooldridge, Canoga Park, Calif.
INFRARED BACKGROUND INVESTIGATION, by R. E. Eisele. Scientific rept. no. 2 on Contract AF 19(604)3473. 15 Mar 60, 48p. 6 refs. [AFCRC] TN-60-408.
Order from LC mi$3.30, ph$7.80 PB 147 544

A measurement field trip was made to Key West, Florida, during the month of June 1959, for the purpose of making sky background measurements. This report contains only the gradient measurements made on this field trip along with enough description of the instrumentation to understand the methods of obtaining the data. (See also PB 143 106)

Visibility Lab., U. of California, San Diego.
THE MEASUREMENT OF LIGHT IN NATURAL WATERS: RADIOMETRIC CONCEPTS AND OPTICAL PROPERTIES, by Rudolph W. Preisendorfer and John E. Tyler. Rept. on Contract NObs-72092. 17 Nov 58, 95p. 17 refs. SIO Reference 58-69; AD-212 695.
Order from LC mi$5.40, ph$15.30 PB 147 598

The object of this note is: (i) to define and discuss those recently developed concepts of geometrical radiometry which are of greatest use in the experimental study of the light field in natural waters; and (ii) to present a systematic development and discussion of the inherent and apparent optical properties of natural waters which are used in modern hydrological optics.

Visibility Lab., U. of California, San Diego.
WATER CLARITY METER: OPERATING AND MAINTENANCE INSTRUCTIONS, by Roswell W. Austin. Rept. on Contract NObs-72092. Feb 59, 109p. SIO Reference 59-9.
Order from LC mi$5.70, ph$16.80 PB 147 597

The Water Clarity Meter, (WCM), has as its purpose the measurement of those optical properties of natural ocean waters which will permit the determination of the optical clarity of these waters in the visible portion of the spectrum. The data obtained from the Water Clarity Meter can be used to determine the depth profiles of attenuation coefficients with sufficient accuracy for hydrographic survey purposes. Such survey data may be used for the computation of sighting ranges for underwater swimmers and underwater television equipment using natural illumination.

Solid State Physics

Brown U., Providence, R. I.
INVESTIGATIONS OF SURFACE PROPERTIES OF SILICON AND OTHER SEMICONDUCTORS, PHASE I [and] II, by H. E. Farnsworth, D. Haneman and others. Scientific rept. no. 2, 1 Jan-31 Mar 60, on Contract AF 19(604)5986. Apr 60, 23p. 5 refs. AFCRC-TN-60-378.
Order from LC mi$2.70, ph$4.80 PB 147 758

Using measurements with an omegatron, the ambient in a low-energy electron-diffraction tube which was pumped but not baked was found to consist mainly of water vapor and mass 28 gas (largely CO). An intense and reproducible diffraction pattern was obtained from a $(11\bar{1})$ surface of GaSb cleaned by ion bombardment and annealing. An n-type germanium crystal of 17 ohm-cm resistivity was subjected to a series of dry-air and vacuum cycles, and simultaneous measurements of filament lifetime and surface conductivity were taken. Further experimental data concerning the formation of p-type films on heat-treated silicon are presented. (See also PB 145 624)

Brown U. Div. of Applied Mathematics, Providence, R. I.
A SYSTEMATIC CALCULATION OF ELASTIC-PLASTIC DEFORMATION OF FRAMES AT IMMINENT COLLAPSE, by Hishashi Tanaka. Technical rept. no. 49 on Contract Nonr-562(10). Aug 59, 50p. 7 refs. Rept. C11-49; AD-226 257.
Order from LC mi$3.30, ph$7.80 PB 147 708

A systematic calculation is shown to estimate the deformation of a frame when plastic collapse is imminent. The method proposed in this paper is convenient in the case of overcomplete collapse as well as in the other cases. (Author)

Carnegie Inst. of Tech., Pittsburgh, Pa.
THEORY OF BLOCH ELECTRONS IN A MAGNETIC FIELD: THE EFFECTIVE HAMILTONIAN, by Walter Kohn. Technical rept. no. 6 on Contract Nonr-760(13). [1959] 69p. 23 refs.
Order from LC mi$3.90, ph$10.80 PB 146 184

The Hamiltonian of a Bloch electron in a static magnetic field is $H = \frac{1}{2}\underset{\sim}{P}^2 + V(\underset{\sim}{r})$, where $V(\underset{\sim}{r})$ is the periodic potential, $\underset{\sim}{P} = \underset{\sim}{p} + \frac{1}{c}\underset{\sim}{A}$, and $\underset{\sim}{A}$ is the vector potential giving rise to the magnetic field $\underset{\sim}{\mathcal{H}}$. We consider the case of a non-degenerate band m. It is then shown that, with an error vanishing with $\mathcal{H}$ like $\mathcal{H}^{N+1}$ (N arbitrary), the eigenstates of H can be calculated from an equivalent Hamiltonian $\underset{\sim}{H}_m(\underset{\sim}{P})$.

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH ON GROWING OF CADIUM SULFIDE FOR DOSIMETER PURPOSES, by W. E. Medcalf, K. E. Bean, and J. E. Powderly. Quarterly rept. no. 1, 17 Apr-17 July 57, on Contract DA 36-039-sc-73270. [1957] 56p. 24 refs.
Order from LC mi$3.60, ph$9.30 PB 137 662

Single crystals of cadmium sulfide 10 mm x 10 mm x 25 mm were prepared by sublimation-recrystallization of cadmium sulfide with crystal growth occurring on a polished clear quartz plate. Dark resistivities of the crystals ranged from 25 thousand ohm-centimeters to 140 million ohm-centimeters. In ten runs cadmium sulfide was doped with indium sulfide (In_2S_3) in amounts ranging from .02 to .055 percent by weight of the cadmium sulfide.

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH ON GROWING OF CADMIUM SULFIDE CRYSTALS FOR DOSIMETER PURPOSES, by J. E. Powderly and K. E. Bean. Quarterly rept. no. 4, 17 Apr 58, on Contract DA 36-039-sc-73270. [1958] 46p.
Order from LC mi$3.30, ph$7.80 PB 137 647

Studies were made of the growth of cadmium sulfide in alumina tubes. The two crystals having the best properties from the standpoint of gamma ray detection had a silicon concentration of 10 to 20 parts per million which is less than the normal concentration. The presence of a small amount of either zinc or silver improved the seeding characteristics of the cadmium sulfide. Cadmium sulfide crystals of high resistivity gave better and more reproducible response to gamma rays when the sample was electroded parallel to the growth axis. (See also PB 137 660)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATION OF METHODS FOR MEASURING THE EQUIVALENT ELECTRICAL PARAMETERS OF QUARTZ CRYSTALS, by Samuel N. Witt, Jr. and Vance Keith Woodcox. Final rept. for 15 Oct 57-14 Oct 58 on Contract DA 36-039-sc-74948, [1958] 123p. AD-212 021.
Order from LC mi$6.30, ph$19.80 PB 148 105

The major developments were concerned with improving the Crystal Measurements Standard System. A new General Radio Admittance Meter was obtained for use with the Standard. Two commercial chain amplifiers were added to the Crystal Measurements Standard to provide isolation and signal gain between the signal generator and Admittance Meter, and between the frequency measuring equipment and the Admittance Meter. The original mixer, i-f amplifier, and local oscillator null detection system was replaced by an Eddystone UHF Receiver to improve the null detection sensitivity. A simplified crystal measurement method, known as the equivalent Circuit Crystal Measurement Method, was developed mathematically. The crystal Measurements Standard System was used to measure the holder and overtone responses of approximately 25 VHF quartz crystals.

Hoffman Electronics Corp., El Monte, Calif.
INVESTIGATION OF LARGE AREA SOLAR CELLS UTILIZING SPHERES OF SILICON, by Eugene L. Ralph and Heinz F. Biekofsky. Technical summary rept. no. 1, 1 Oct-31 Dec 59, on Contract DA 36-039-sc-85243. [1959] 48p. 3 refs.
Order from LC mi$3.30, ph$7.80 PB 148 111

Theoretical analysis and experimental tests indicate, that the preparation of photovoltaic energy converters several square feet in area is possible by using a composite of a multitude of intimate individual cells, prepared from spheres of semiconducting material. Investigations were started to determine the optimum performance of this type device and to determine the parameters on which it is dependent. Sphere arrangements intercepting 98% of the incident light were prepared. Geometrical-optical factors studied are sphere arrangement, sphere size and spacing, and effects due to reflections from the meniscus around the sphere. A theoretical analysis of a honeycomb lens system shows capabilities of achieving 100% light utilization with loose packing of spheres. Preliminary electrical tests show present efficiencies in the 3 to 5% range with improvements expected. (Author)

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
GENERALIZATION OF THE THEORY OF THE ISOTHERMAL BLEACHING OF F-CENTERS IN X-RAYED ALKALI HALIDES, PART A [and] ELECTRON MICROSCOPY EXAMINATION OF TRACKS OF FISSION PRODUCTS IN MICA CRYSTALS, PART B, by Guido Bonfiglioli, Peiro Brovetto and others. Final rept. on Contract AF 61(514)1333. Mar 60, 40p. 7 refs. AFOSR-TR-60-67.
Order from LC mi$3.00, ph$6.30 PB 147 500

This report completes the previous note on the theory of the isothermal bleaching of F Centers in X-rayed alkali halides. The calculations are developed in a more general way; an iteration procedure is introduced to improve the accuracy of the solution; the solution used in comparing theory to experiment is justified, showing that it does not change appreciably after a further iteration step. The report also deals with some experiments intended to clear the information which electron microscopy could offer in problems concerning the effect of fast particle irradiation of non metallic crystals. The tracks are essentially cylindrical thermal spikes of a diameter consistent with the theoretical estimates. The peculiar dashed aspect of some tracks is discussed and related to interference contrast effects or possibly incipient annealing. (See also PB 145 681)

Lockheed Aircraft Corp., Sunnyvale, Calif.
IMPLICATIONS OF PARITY NONCONSERVATION AND TIME REVERSAL NONINVARIANCE IN ELECTROMAGNETIC INTERACTIONS. PART II. ATOMIC ENERGY LEVELS, by M. Sachs, and S. L. Schwebel. Technical rept. July 59, 59p. 18 refs. LMSD-49760; AD-227 949.
Order from LC mi$3.60, ph$9.30 PB 147 678

It was pointed out previously (Annals of Physics, 6:244, 1959) that the premises of Lorentz and gauge invariance in electromagnetic interactions are consistent with a theory which violates both parity conservation and time reversal invariance through a symmetrization of these interactions in terms of the electric and magnetic field variables. Such a symmetrization enlarges the class of scalar interaction terms to include corresponding pseudoscalar terms in the interaction Hamiltonian operator. The existance of such interactions in nature has not thus far been established. The purpose is to explore the implications of the existence of these interaction terms in a variety of different physical situations involving the interactions of charged particles. The implications of this theory is derived with regard to the properties of atoms and their associated spectra. (Author)

Materials Research Lab., Watertown Arsenal, Mass.
HARTREE-FOCK ATOMIC SCATTERING FACTORS FOR THE NEUTRAL ATOM IRON TRANSITION SERIES, by A. J. Freeman and R. E. Watson. Apr 60, 13p. 20 refs. MRL rept. no. 74.
Order from LC mi$2.40, ph$3.30 PB 146 399

Atomic scattering factors for the lowest neutral atom $3d^{n-2}\ 4s^2$ states have been calculated for the atoms Ti through Zn using recently computed Hartree-Fock analytic wave functions for the ground state of the atom. Also given are tabulations of the individual transforms for the 3d and 4s electrons. The results are compared with previous calculations for these atoms and the effect of the 4s electrons on the form factors of the 3d and core electrons is discussed. (Author)

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
CONDENSATION COEFFICIENTS FOR SILVER, CADMIUM AND ZINC IN ULTRAHIGH VACUA, by R. A. Rapp, J. P. Hirth, and G. M. Pound. Technical rept. no. 2 on Contract Nonr-760(17). 18 Aug 59, 88p. 58 refs. AD-226 229.
Order from LC mi$4.80, ph$13.80 PB 147 722

A condensation coefficient of unity has been determined for silver at high fluxes over a temperature range of 45°C to 440°C and at residual gas pressures ranging from 10^{-4} to 6×10^{-10} mm Hg. Condensation coefficients of unity have been established for Zn at 68°C and Cd at 18°C in ultrahigh vacuum. The adsorption of gaseous impurities at residual gas pressures of 10^{-4} mm Hg did not affect the condensation coefficient of cadmium at 23°C for condensation at high fluxes. (Author)

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
ON TWO DIMENSIONAL NUCLEATION, by J. P. Hirth. Rept. on Contract Nonr-760(08). [1959] 5p. 9 refs.
Order from LC mi$1.80, ph$1.80 PB 147 710

New York U., N. Y.
PARAMAGNETIC RESONANCE IN THE SOLID STATE, by Hartmut Kallmann. Quarterly rept. no. 6, Oct-Dec 59, on Contract DA 36-039-sc-78056. Feb 60, 7p.
Order from LC mi$1.80, ph$1.80 PB 147 931

Instrumental equipment has been improved with respect to sensitivity. Investigation of the radiation chemistry of benzene-carbon tetrachloride mixtures has been continued. The number of free radicals produced by ionizing radiation is determined by the decrease in the concentration of diphenylpicrylhydrazyl as detected by EPR. The presence of trapped electrons in zinc sulfide phosphors is now investigated at low temperatures. Early results indicated that no increase in number of unpaired electron spins occurred at low temperature. The effect is to be studied under conditions more favorable for the trapping of electrons. (Author)

Pennsylvania State U., University Park.
RESEARCH AND DEVELOPMENT ON X-RAY ANALYSES OF SINGLE CRYSTALS OF MICROSCOPIC SIZE, by Ray Pepinsky. Final rept. on Contract DA 36-061-ORD-478. 15 Oct 58, 4p. 1 ref. OOR rept. 761.10P; AD-117 850.
Order from LC mi$1.80, ph$1.80 PB 147 855

Philco Corp., Philadelphia, Pa.
RESEARCH INVESTIGATION OF RADIATIVE RECOMBINATION AND LIFETIME IN SEMICONDUCTORS, by C. V. Bocciarelli. Final rept., 1 May 57-30 Apr 58, on Contract NObsr-72695. [1958] 31p. 7 refs. Philco no. H-2126; AD-207 055.
Order from LC mi$3.00, ph$6.30 PB 148 032

The radiation recombination from germanium was found to be the result of direct band to band hole-electron recombination. Optical injection experiments demonstrated that this radiation depends on injected carrier densities. Measurements of the recombination radiation from germanium diodes showed that the intensity of radiation, U, follows a power law $U\ I^{\alpha}$ where α, a constant for a given sample, varies between 1.2 and 1.6 for different diodes. The peak of the radiation corresponds to an energy of 0.70 ev for both electrically and optically induced radiation. Experiments on optically excited indium antimonide showed no radiation that could be attributed to recombination. The luminescent radiation emitted from activated cadmium sulphide excited by blue or ultraviolet light can be accurately controlled (modulated) by the application of very low AC or DC fields. When the cadmium sulphide is insulated from the field plates, the percentage modulation is very small. When the cadmium sulphide is in electrical contact with the field

plates, the percentage modulation is large and is proportional to the intensity of the excitation. The recombination radiation from cadmium selenide and from red fluorescent cadmium sulphide (in the visible region) can be modulated in a similar way.

Polytechnic Inst. of Brooklyn, N. Y.
LATTICE III, by E. Banks. Progress rept. no. 1, 1 June-31 Aug 56, on Contract DA 36-039-sc-71242. 24 Sep 56, 35p. 3 refs.
Order from LC mi$3.00, ph$6.30 PB 138 210

New magnetic oxides have been prepared by reaction of rare-earth, sodium and iron oxides, and sodium, zinc and iron oxides. The latter appear to have distorted spinel structures. Magnetization and Curie point measurements are reported. Progress is reported on investigations of copper-iron selenides and related compounds. Some observations on visible fluorescence in sulfate-sulfide systems are presented (Author)

Polytechnic Inst. of Brooklyn, N. Y.
LATTICE III, by E. Banks. Progress rept. no. 2, 1 Sep-31 Oct 56, on Contract DA 36-039-sc-71242. 23 Dec 56, 26p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 138 209

Preparations in which ZnO (and MgO) were substituted in $BaFe_{12}O_{19}$ show an increase in magnetization at room temperature and 78°K over the parent compound. Some strongly magnetic compositions, in the system Na_2O-ZnO-Fe_2O_3, have been prepared, with maximum near composition $Na_{0.33}Zn_{0.32}Fe_{2.33}O_4$. A cubic phase exists near $CuFe_2Se_3$, becoming noncubic in the region of $Cu_{0.75}Fe_{2.25}Se_3$ and $Cu_{0.50}Fe_{2.50}Se_3$. (See also PB 138 210)

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.
STUDIES IN THE THEORY OF SHOCK PROPAGATION IN SOLIDS. CHAP. I. THE PERMANENT REGIME SOLUTION. CHAP. II. FORMAL THEORY OF ANELASTICITY. CHAP. III. STEADY-STATE COMPRESSION PROFILES PROPAGATING IN HEAT-CONDUCTING ANELASTIC SOLIDS, by William Band. Rept. on Contract AF 49(638)625. 3 Sep 59, 61p. 21 refs. SRI Proj. CU-2912. AFOSR-TN-59-1280.
Order from LC mi$3.90, ph$10.80 PB 147 515

This report, in three sections, presents a theoretical treatment of compressive wave propagation in an anelastic solid. In such a solid stress depends not only on strain but also on strain rate or stress rate. The theory leads to a prediction of the shape or profile of shock fronts in such solids. (Author)

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES, by M. W. P. Strandberg and R. L. Kyhl. Quarterly progress rept. no. 8, 15 May-15 Aug 59, on Contract DA 36-039-sc-74895. [1959] 20p. 4 refs. AD-228 372.
Order from LC mi$2.40, ph$3.30 PB 147 970

The saturation of a paramagnetic-spin system by 13-mc phonons was studied as a function of the paramagnetic-spin resonance frequency. Both frequency-dependent and frequency-independent effects are reported. A preliminary comparison is made of the ratio of the specific paramagnetic ion density to the average paramagnetic ion density in flame-fusion and hydrothermally grown ruby. No significant differences were observed. A modification to the Bloch equations is proposed. This modification is based on recent analytical results. A short description of a unidirectional amplifier formed from a cascade of regenerative cavities is presented. (Author)

St. Louis U., Mo.
SEMICONDUCTING PROPERTIES OF BORON, by Vincent P. Jacobsmeyer, Frank L. Gebhart, and Edward F. Juenke. Final technical rept. for 1 Feb 57-31 Jan 58 on Contract DA 23-072-ORD-1101. [1958] 61p. 39 refs. OOR rept. 1845.1; AD-156 536.
Order from LC mi$3.90, ph$10.80 PB 147 866

Growth of B single crystals by recrystallization methods: Attempts were made to grow B crystals by a solid state transformation process. A study was made of the depositional forms of B by means of x-ray diffraction patterns. Patterns were obtained for representative samples deposited in the 550° to 1500°C range; at least 2 crystalline forms of B were clearly indicated. Samples deposited in the range from 772° to 125°C were subjected to heat-treatment. The crystalline structure of the B specimen was independent of the method of cooling after the heat-treatment. Recrystallization in the higher temperature phase was studied in a single specimen at 1482°C. An x-ray transmission pattern obtained after cooling was identical to a pattern obtained from a typical 1500°C deposit. AC apparatus: The apparatus was constructed around a feedback amplifier with a gain of the order of 10^5 and a bandwidth of 2 c centered about 24 c. The apparatus was tested on Ge; it detected a large signal from this material.

Stanford Electronics Labs., Stanford U., Calif.
STUDIES OF MICROPLASMAS AND HIGH-FIELD EFFECTS IN SILICON. Quarterly status rept. no. 1, 15 Feb-15 May 59 on Contract DA 36-039-sc-78272. [1959] 10p. 2 refs. AD-226 660.
Order from LC mi$1.80, ph$1.80 PB 146 272

Research is reported, having as its objective the study of microplasmas in silicon and related effects. Hot electrons in silicon are to be studied, since the technology of this material is under good control and the effect is present to a fairly strong degree. The preparation of appropriate silicon specimens was accomplished by the diffusion of boron into silicon. A limited degree of success was achieved and the system is described in detail. Basically, an open tube system is used to establish a neutral atmosphere. Contained within this atmosphere is a quartz box which maintains a separate atmosphere. A neutral atmosphere is important since there is leakage between the two atmospheres. A basic experiment relating directly to the behavior of electrons in high fields is being conducted on photoelectric emission of electrons from the conduction bands. Work is also underway to fabricate devices for the high field studies.

Stanford Electronics Labs., Stanford U., Calif.
STUDIES OF MICROPLASMAS AND HIGH-FIELD EFFECTS IN SILICON. Quarterly status rept. no. 2, 16 May-15 Aug 59, on Contract DA 36-039-sc-78272. [1959] 35p. 1 ref. AD-231 563.
Order from LC mi$3.00, ph$6.30 PB 147 932

Progress is reported in the following areas: device techniques, experimental techniques for studying hot electrons, and a study of hot electrons in silicon by photoemission. Discussions are appended on (1) an expression for the total photoelectric current, and (2) the effect of field and photoelectric emission of a hot electron.

Stanford Electronics Labs., Stanford U., Calif.
STUDIES IN MICROPLASMAS AND HIGH-FIELD EFFECTS IN SILICON. Quarterly status rept. no. 3, 16 Aug-15 Nov 59, on Contract DA 36-039-sc-78272. [1959] 14p. 1 ref.
Order from LC mi$2.40, ph$3.30 PB 147 933

An apparent correlation has been observed between surface imperfections and the breakdown phenomenon. Two methods for observing the nature of the imperfections are being considered. An experiment is described which is designed to investigate electron distribution in the conduction band of n-type silicon. (See also PB 147 932)

Stanford U., Calif.
PARAMAGNETIC RELAXATION IN SOLUTIONS OF VO^{++}, by R. N. Rogers and G. E. Pake. Technical note no. 4 on Paramagnetic Resonance, Contract AF 18(603)131. Apr 60, 21p. 15 refs. AFOSR-TN-60-429.
Order from LC mi$2.70, ph$4.80 PB 147 741

The ESR spectrum of vanadyl ion in solutions has the interesting feature that the linewidths of the individual hyperfine components depend on the nuclear spin orientation, m_I. We have determined that the origin of the effect is the mechanism proposed by H. M. McConnell, namely, that the existence of a "microcrystal" about the VO^{++} ion which gives rise to anisotropies in the g-tensor and hyperfine interaction. By comparing the results of linewidth measurements made at 9.25 kmc and at 24.3 kmc with the results of calculations made by D. Kivelson, we were able to conclude the validity of the microcrystallite model. (Author)

Syracuse U. Research Inst., N. Y.
MEAN ADSORPTION LIFETIME OF Rb ON ETCHED TUNGSTEN SINGLE CRYSTALS. I. IONS, by F. L. Hughes and H. Leninstein. Final rept. pt. 1 on Interaction of Thermal Atoms with Surfaces, Contract DA 30-115-ORD-815. 1 Sep 58, 31p. 31 refs. OOR rept. no. 1844.3; AD-201 153.
Order from LC mi$3.00, ph$6.30 PB 147 868-1

Syracuse U., Research Inst., N. Y.
MEAN ADSORPTION LIFETIME OF Rb ON ETCHED TUNGSTEN SINGLE CRYSTALS. II. NEUTRALS [and] SURFACE PROPERTIES OF ETCHED TUNGSTEN SINGLE CRYSTALS, by F. L. Hughes, H. Levinstein, and R. Kaplan. Final rept. pt. 2 on [Interaction of Thermal Atoms with Surfaces.] Contract DA 30-115-ORD-815. [1 Sep 58] 35p. 32 refs. OOR rept. no. 1844.3; AD-201 153.
Order from LC mi$3.00, ph$6.30 PB 147 868-2

Transitron Electronic Corp., Wakefield, Mass.
THE EPITAXIAL GROWTH OF HEXAGONAL SILICON CARBIDE ONTO SEEDS, by Karl M. Hergenrother. Scientific rept. no. 2 on Contract AF 19(604)4989. 1 Apr 60, 18p. 6 refs. AFCRC-TN-60-372.
Order from LC mi$2.40, ph$3.30 PB 147 769

It has been found possible to grow single crystal epitaxial films of silicon carbide from the vapor phase onto a silicon carbide seed. These crystals are grown in a specially designed furnace which is capable of reaching 2800°C, is vacuum tight and clean enough to permit the control of the resistivity and type of film grown. Details of the furnace design and operation are discussed. The various parameters which control the properties of the films are discussed. (Author)

Wayne State U., Detroit, Mich.
1/f NOISE IN SINGLE-CRYSTAL GERMANIUM FILAMENTS, by V. E. Noble and J. E. Thomas, Jr. Technical note no. 4 on Contract AF 49(638)158. 1 Mar 60, 113p. 84 refs. AFOSR-TN-60-311.
Order from LC mi$6.00, ph$18.30 PB 147 774

The variation of 1/f noise in germanium filaments as a function of the surface potential has been investigated by varying the gaseous ambient surrounding the noise sample. Noise measurements on 32 ohm cm n-type, 8.5 ohm cm n-type, and 9 ohm cm p-type material showed a definite noise minimum when the value of the surface potential corresponded with the sample conductance minimum. Noise amplitude calculations, based on McWhorter's majority carrier trapping effect, were within a factor of two of the observed accumulation-layer noise observed in the case of the near-intrinsic material. The inversion-layer noise was greater than both the predicted value and the observed accumulation-layer noise.

Westinghouse Research Labs., Pittsburgh, Pa.
ELECTRON-SPIN-LATTICE RELAXATION IN DILUTE POTASSIUM CHROMICYANIDE AT HELIUM TEMPERATURES, by J. G. Castle, Jr., P. F. Chester, and P. E. Wagner. Rept. for 2nd quarter on Contract AF 19(604)5589. 7 Mar 60, 42p. 37 refs. Research rept. 403FD449-R4; AFCRC-TN-60-179.
Order from LC mi$3.30, ph$7.80 PB 147 303

Measurements have been made of the electron spin lattice relaxation of the $-1/2, +1/2$ line of Cr^{+++} in $K_3Co(CN)_6$ at 9 KMc/sec as a function of temperature, chromium concentration, and the proximity of the $-3/2, -1/2$ line. The experimental procedure, involving inversion of the line, is capable of distinguishing a "bottleneck" relaxation time from a true spin-phonon relaxation time, T_1. At Cr^{+++} concentrations up to 0.5 per cent, the relaxation data are fitted well by single exponential functions of time. Between 1.3°K and 4.8°K, T_1 varies approximately at $T^{-1.2}$ indicating

that the single phonon process is dominant. No phonon-bath bottleneck is observed, in agreement with calculations based on the measured parameters. A "proximity effect" is observed in which the relaxation rate of the - 1/2, + 1/2 line is enhanced when the - 3/2, - 1/2 line is within 20 linewidths. At one per cent Cr^{+++}, the relaxation behavior is markedly different: the recovery is considerably faster and can no longer be described by a single time constant. This change and the proximity effect are interpreted qualitatively in terms of spin cross relaxation. The measured linewidth increases with concentration from 0.03 per cent to 2 per cent Cr^{+++}, even though the line is observed to be inhomogeneous at and below 0.5 per cent Cr^{+++} (Author)

Theoretical Physics

Air Force Cambridge Research Center, Bedford, Mass.
CONTRIBUTIONS TO THE THEORY OF PARTIAL COHERENCE, by George B. Parrent, Jr. (Victoria U. of Manchester). Doctoral thesis. Mar 60, 106p. 53 refs. AFCRC-TR-60-124.
Order from LC mi$5.70, ph$16.80 PB 147 645

A brief survey of previous developments in the theory of partial coherence is given in Chapter 1 and the relations between the complex degree of coherence (see Wolf 1955) and the measures of coherence introduced by earlier authors are given. Coherence theory is formulated in terms of correlation functions and analytic signals and the developments of this thesis required several new theorems concerning the convolution and cross-correlation of analytic signals. These theorems are developed in Chapter 2. In Chapter 3 these theorems are applied to the detailed analysis of the limiting forms of the mutual coherence function for both polychromatic and quasi-monochromatic fields. In Chapter 4 the propagation of mutual coherence is studied. The results of the previous chapters are applied in Chapter 5 to a frequency domain analysis of the optical imaging problem.

Air Force Cambridge Research Center [Bedford, Mass.]
PROCEEDINGS OF SYMPOSIUM ON THE PLASMA SHEATH 7-9 DECEMBER 1959, VOLUME 1. [1960] 228p. 73 refs. AFCRC-TR-60-108(I).
Order from LC mi$9.90, ph$34.30 PB 147 639

This initial Symposium was directed toward bringing together those people interested in the Plasma Sheath problem as it affected communication to and from a plasma sheathed hypersonic vehicle and the detection of this vehicle by radar techniques. The proceedings have been divided among three publications. Pergamon Press will publish 20 of the unclassified papers in book form available to the public. This publication includes 8 additional unclassified papers. AFCRC-TR-60-108-II will contain 5 Classified papers. To assist the reader both AFCRC publications will include a table of contents listing the papers in all three publications and a copy of all unclassified abstracts. (Author)

Avco-Everett Research Lab., Mass.
BIBLIOGRAPHY ON MAGNETOHYDRODYNAMICS, PLASMA PHYSICS, AND CONTROLLED THERMONUCLEAR PROCESSES, by Barbara A. Spence. Oct 59, 101p. 1562 refs. AMP 36; AD-233 709.
Order from OTS $2.50 PB 161 825

Reference sources for the bibliography included Physics Abstracts; Nuclear Science Abstracts; Mathematical Reviews; Technical Translations, and U.S. Government Research Reports, published by the Office of Technical Services of the Department of Commerce; the Armed Services Technical Information Agency's Technical Abstract Bulletin, reference lists published in conference proceedings, publishers' catalogs, publications lists which we received from several agencies performing work in these fields, and recent issues of certain journals themselves. References are included to books, reports, conference proceedings and papers published in the open literature between 1925 and September, 1959. Books and journal articles are listed under the name of the first author. Reports are referenced under the name of the issuing agency. The name of each author of a report is included in the Author Index, so that, by using the Author Index, the user can quickly locate all references to work of a single author.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by A. Aharoni, K. Rose, and S. Takeda. Quarterly progress rept. no. 1, 1 Mar-31 May 59, on Contract DA 36-039-sc-78313. [1959] 46p. 8 refs. AD-229 822.
Order from LC mi$3.30, ph$7.80 PB 148 109

Optical and microwave measurements of shock wave phenomena in gases excited by ultra fast-high energy electrical discharges are reported. Special microwave techniques have been developed to measure the electron density and collision frequency. Difficulties were encountered in separating the shock wave from the "blow down" plasma. An analysis of second harmonic effects in semiconductors was completed. Further investigation proved that the extra pulse effect could be attributed to the influence of the magnetron second harmonic output power. Work was initiated to extend the "hot electron" effect to higher and lower semiconductor conductivities. Microwave transmission measurements through TE mode semiconductor filled cavities are reported. (Author)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by A. Aharoni, K. Rose and others. Quarterly progress rept. no. 2, 1 June-31 Aug 59, on Contract DA 36-039-sc-78313. [1959] 40p. AD-232 124.
Order from LC mi$3.00, ph$6.30 PB 148 110

Experiments on the production and study of shock waves of moderate strengths, in gaseous discharges, were continued. A new method of determining the var-

ious characteristics of these shock fronts was developed. Research on semi-conductor behavior in high level microwave fields was continued using resonant cavity techniques at 8-mm wavelengths. ILLIAC computations have been completed to determine the resonance conditions for a high resistivity semiconductor sample in a TM_{011} mode cylindrical cavity of circular cross section. The results of these calculations have been compared with those based on an impedance-matching technique, thereby confirming and extending them. In addition, an improved method has been developed for relating the parameters of the cavity to the experimental measurements using equivalent circuit concepts. Preliminary measurements have been made on the TM mode cavity with high conductivity and high resistivity samples. The high conductivity samples are found to interact more strongly with the microwave field than was the case with the TE mode cavity. (Author) (See also PB 148 109)

Institute of Field Physics, U. of North Carolina, Chapel Hill.
INVARIANT COMMUTATORS FOR THE QUANTIZED GRAVITATIONAL FIELD, by Bryce S. DeWitt. Rept. on Contract AF 49(638)563. Jan 60, 24p. 11 refs. Publication no. 6; AFOSR-TN-60-87; AD-233 367.
Order from LC mi$2.70, ph$4.80 PB 146 949

The difficulties encountered in applying quantum mechanics to Einstein's theory of gravitation are twofold: (1) the nonlinearity of the theory, and (2) its coordinate invariance, which leads to constraints on the Cauchy data for the dynamical equations. These difficulties are shown not to be so severe, and the basic commutators of the theory are displayed in co-variant form. The commutators are approached through the canonical theory of Poisson brackets to emphasize the applicability of the results to classical and quantum theory. The derivations are based on the recognition of the action as the generator of a finite canonical transformation and on the use of the fundamental theorem of classical transformation theory; the variation in the functional form of the generator of a finite canonical transformation, due to independent infinitesimal canonical transformation of its arguments is equal to the difference of the associated independent infinitesimal generators.

Maryland U., College Park.
DISTRIBUTION FUNCTIONS AND QUANTUM STATISTICS, by Robert Ayres. [Rept. on Contract AF 49(638)399]. May 60, 46p. 19 refs. Dept of Physics Technical rept. no. 179; AFOSR-TN-60-522.
Order from LC mi$3.30, ph$7.80 PB 147 937

A new formulation of quantum statistical mechanics is given, in terms of distribution functions. It is shown that all quantities of interests are obtained directly from the distribution of particles in k-space, $n(k, \beta)$ and the reaction operator K (often called the Brueckner K-matrix) which is familiar from stationary-state many-body perturbation theory. An integral equation for $n(k, \beta)$ is found, which can be solved by a converging iteration process. Some remarks are included on the application of the virial theorem to systems characterized by zero pressure. (Author)

Maryland U., College Park.
THE ZERO-POINT ENERGY OF AN ELECTRON LATTICE, by Alexei A. Maradudin (Inst. for Fluid Dynamics and Applied Mathematics) and Rosemary A. Coldwell-Horsfall. [Rept. on Contract AF 49(638)24.] May 60, 36p. 23 refs. Technical rept. no. 177; AFOSR-TN-60-446.
Order from LC mi$3.00, ph$6.30 PB 147 739

At very low densities an electron gas in a compensating uniform background of positive charge crystallizes into a body-centered cubic lattice for which the correlation energy per electron is $(-1.792/r_s)$ Ry. At higher densities the first correction to this result arises from the zero-point energy of the electrons, which can be expanded in terms of the even moments of the frequency spectrum. We have computed the first five non-vanishing moments and have estimated the contribution to the zero-point energy from the remaining moments using their known asymptotic behavior. This procedure leads to the value $(2.638/r_s^{3/2})$ Ry. for the zero-point energy per electron. The low temperature specific heat per electron is found to be $56.21\ k\ r_s^{9/2}.(kT)^3$Ry. The range of r_s values for which these results should be valid is discussed on the basis of Lindemann's melting formula. (Author)

Microwave Lab., Stanford U., Calif.
GENERALIZATION OF THE LAGRANGE EXPANSION, WITH APPLICATION TO PHYSICAL PROBLEMS, by P. A. Sturrock. Scientific rept. no. 18 on Contract AF 19(604)1930. Dec 59, 15p. 6 refs. M. L. rept. no. 668; AFCRC TN-60-117; AD-233 866.
Order from LC mi$2.40, ph$3.30 PB 146 326

Problems of fluid dynamics are discussed in the Lagrangian description by means of the displacement-vector function. The Eulerian variables describing the motion may be obtained from the displacement-vector function by a generalization of the Lagrange expansion which is established. Two examples of the application of this expansion are given: the derivation of the Fokker-Planck equation, and the description of the surface conditions of a rippling electron stream by the device of equivalent surface charges. (Author)

Naval Research Lab., Washington, D. C.
STARK BROADENING OF HYDROGEN LINES IN PLASMA, by H. R. Griem, A. C. Kolb, and K. Y. Shen. 4 Mar 60, 26p. NRL rept. 5455.
Order from LC mi$2.70, ph$4.80 PB 144 638

The frequency distributions of hydrogen lines broadened by the local fields of both ions and electrons in a plasma are calculated in the classical path approximation. A complete set of curves is presented for electron densities in the range 10^{14} to 10^{19} cm^{-3} for the temperature range 10,000°K to 40,000°K.

Polytechnic Inst. of Brooklyn, N. Y.
ELECTRON DISTRIBUTION ACROSS A DISCONTINUITY OF ION DENSITY IN A PLASMA, by Manlio Abele. Rept. on Contract AF 30(602)2045. Mar 60, 16p. 2 refs. PIBAL rept. no. 549; RADC-TN-60-77.
Order from LC mi$2.40, ph$3.30 PB 146 769

The problem of the electron distribution in the vicinity of a discontinuity of ion density is discussed in the present report, assuming that a plane infinite surface separates a uniform plasma from a vacuum. The density of electrons in the vacuum is always very small compared to the ion density of the plasma. The results indicate that the electron density vanishes at large distance from the interface with a rate of decrease which is small compared to the rate of change of the electron density within the plasma. (Author)

Republic Aviation Corp. [Farmingdale, N. Y.]
AN OUTLINE OF THE BASIC THEORY OF MAGNETOHYDRODYNAMICS, by P. N. Hu. Technical rept. on Contract AF 29(601)1218. 15 Nov 58, 60p. 30 refs. MSD Rept. no. 206-950-2; AFSWC-TR-58-46; AD-208 851.
Order from LC mi$3.60, ph$9.30 PB 146 108

A survey of the basic theory of magnetohydrodynamics is given together with a review of the fundamental concepts of electrodynamics and the motion of a charged particle. The basic equations used for a viscous, heat-conducting, radiating, electrically-conducting, and compressible fluid are the Maxwell's equations, the momentum equation, the continuity equation, the ideal gas law, the energy equation, and Ohm's law. The most general form of these equations is derived and then reduced to various approximate forms. The associated boundary conditions for the electric and magnetic fields, pressure, velocity, and heat energy are also derived. Solutions to several problems are noted. (Author)

Schwinger, Julian, Cambridge, Mass.
INVESTIGATION OF HIGH FREQUENCY LIMITATIONS IN MILLIMETER WAVE GENERATORS, by Julian Schwinger. Final rept. for Aug 59-Feb 60 on Contract DA 36-039-sc-78282. [1960] 38p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 147 983

Need of a quantum-mechanical formalsim for systems with dissipation, applicable to the radiation field of a cavity, is discussed. Approximations with respect to loss mechanism which underlie the concept of dissipation are discussed. A generalization of the solution, to provide for a classical driving force and coupled atomic systems, is given. (Author)

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
PLASMA SHEATH CHARACTERISTICS ABOUT HYPERSONIC VEHICLES, by H. G. Lew and V. A. Langelo. Rept. on Contract AF 04(647)269. 6 Apr 60, 49p. 7 refs. Technical Information Series R60SD356.
Order from LC mi$3.30, ph$7.80 PB 147 636

This paper considers vehicle induced interferences to signal transmission and presents some results for a typical re-entry body. The shock layer for such a body is investigated including the effects of non-equilibrium. The ionized wake behind the body is discussed for both the continuum and rarefied gaseous states. Finally, an estimate of the attenuation of a plane wave through the ion sheath is given. (Author)

Thermodynamics

Air Force Special Weapons Center, Kirtland AFB, N. Mex.
THERMODYNAMIC PROPERTIES OF AIR AT HIGH TEMPERATURES, by James E. Weidenborner. Dec 56, 66p. 8 refs. AFSWC-TN-56-48; AD-96 301.
Order from LC mi$3.90, ph$10.80 PB 148 280

This report presents, in graphical form, a number of thermodynamic properties and shock parameters based upon a new equation of state for air computed by the National Bureau of Standards. Isotherms, adiabats, and shock-front parameters at varying altitudes for air were computed from the NBS equation of state data, which is also included in this report, and plotted in appropriate graphical form over a wide range of density, pressure, and temperature. A study of the isotherms, adiabats, and shock parameters shows that these curves do not deviate greatly from similar curves obtained by previous investigators using other equations of state for air. The isotherms in this report, however, cover a wider range of density, pressure, and temperature than any set of curves heretofore available. The graphs of shock parameters show that these vary with altitude, not greatly, but in an orderly manner. (Author)

Arnold Engineering Development Center [Tullahoma, Tenn.]
MOLLIER DIAGRAM FOR NITROGEN, by R. L. Humphrey, W. J. Little, and L. A. Seeley. Rept. on ARO, Inc. Contract AF 40(600)800. May 60, 39p. 4 refs. AEDC-TN-60-83.
Order from LC mi$3.00, ph$6.30 PB 147 728

Thermodynamic data for nitrogen are presented in Mollier diagram form covering the temperature range of 30°K to 15,000 $^{\circ}$K and the density range of 10^{-6} to 10^{3} atmospheres. (Author)

Little, Arthur D., Inc., Cambridge, Mass.
HIGH TEMPERATURE THERMAL RADIATION PROPERTIES OF SOLID MATERIALS, by Henry H. Blau, Jr., Eleanor Chaffee and others. Scientific rept. no. 2 on Contract AF 19(604)2639. 31 Mar 60, 61p. 7 refs. AFCRC-TN-60-165.
Order from OTS $1.75 PB 161 773

This report describes the first phase of an experimental study of the thermal radiation properties of solid materials at elevated temperatures. The basic objectives of the study have been: (a) to establish techniques for measurement of spectral and total emissivity and emittance of solid materials at temperatures as high as 4000K, (b) to determine the practical accuracy of these techniques, and (c) to determine the thermal radiation characteristics of selected materials of interest.

Polytechnic Inst. of Brooklyn, N. Y.
TEMPERATURE DISTRIBUTION AND THERMAL STRESSES IN STRUCTURES WITH CONTACT RESISTANCES, by Frederick V. Pohle, T. J. Lardner, and Francis W. French. Rept. on Contract AF

49(638)302. May 60, 32p. 22 refs. PIBAL rept. no. 557; AFOSR-TN-60-504.
Order from LC mi$3.00, ph$6.30 PB 147 783

The temperature distribution in a built-up structure in the form of an I-section composed of cover plates and a web is investigated for the case of a contact resistance at the junction of the cover plates and the web. The temperature-discontinuity condition is discussed in the light of previous experimental work, and a new junction condition is proposed. Graphs of temperatures and stresses are presented for the case of constant flux of heat to the cover plates. (Author)

Woods Hole Oceanographic Institution, Mass.
MEASUREMENTS OF RADIATIVE FLUX FROM AN AIRBOURNE RADIOMETER, by David B. Clarke. Technical rept. no. 43 on Marine Meteorology, Contract Nonr-1721(00). Aug 59, 22p. 7 refs. Ref. no. 59-40; AD-226 010.
Order from LC mi$2.70, ph$4.80 PB 148 175

An airborne instrument is described that is being developed to investigate the radiative heat balance in the lower troposphere. The instrument, a radiometer, essentially derives the radiative flux by measuring the temperature on opposite sides of an insulator. The radiometer was mounted on anR4D Naval research airplane on 2 struts trailing from the port wing, and in Nov 1958, was flown from Woods Hole to Trinidad and back. Radiation measurements were obtained along the route but most measurements were obtained in an area about 50 mi east of Trinidad. The radiometer's construction consists of a disc of aluminum foil 2 in. in diameter which acts as the sensor that receives the radiation. A small bead thermistor is sandwiched between the disc's under side and another small piece of aluminum foil to measure the disc's temperature. The bead and the small foil are taped tightly to the larger disc to insure good thermal contact. Results indicate that the radiometer was not too satisfactory. It was too slow in response and not constructed carefully enough to give the desired accuracy needed for net fluxes, flux divergence, and radiative cooling. The radiometer had the advantage of being relatively inexpensive to build and maintain, and of being simple in principle and construction.

Wave Propagation

Institute of Mathematical Sciences, New York U., N. Y.
SCATTERING OF A SURFACE WAVE BY A DISCONTINUITY IN THE SURFACE REACTANCE ON A RIGHT ANGLED WEDGE, by Frank C. Karal, Jr. and Samuel N. Karp. Rept. on Contract AF 19 AF 19(604)5238. Feb 60, 29p. 23 refs. Research rept. no. EM-146; AFCRC-TN-60-196.
Order from LC mi$2.70, ph$4.80 PB 147 526

This report considers the electromagnetic field that arises when a surface wave travels along the front face of a right angled wedge and is scattered by the tip. An impedance type boundary condition is prescribed on the front face of the wedge and a simple boundary condition (that for perfect reflection) is prescribed on the other. The impedance boundary condition is such that surface waves are generated. An exact mathematical solution is presented in elementary form for this problem and the amplitude of the reflected surface wave is found. A simple representation for the radiated far field amplitude is given. The important special cases of small and large reactance are discussed. For large reactance the wave is closely bound to the surface, which may then be regarded as a surface-wave-guide. In this limit there is complete reflection of the surface wave, with a change in phase of $\pi/3$. The question is raised as to what change of phase ought to be assigned, in general, so as to describe reflection at an 'open end' of a surface-wave-guide. (Author)

National Bureau of Standards, Boulder, Colo.
A SURVEY AND BIBLIOGRAPHY OF RECENT RESEARCH IN THE PROPAGATION OF VLF RADIO WAVES, by James R. Wait. May 60, 47p. 326 refs. Technical note no. 58.
Order from OTS $0.75 PB 161 559

Attention is confined primarily to terrestrial propagation, and thus solar and exospheric phenomena are generally excluded although certain germane references dealing with these subjects are given in the bibliography. First a brief description of recent advances of ground wave propagation is given. This is followed by sections on ray and mode concepts of ionospheric propagation. The research dealing with the waveforms of atmospherics is also considered. Finally some recent applications of VLF propagation are described.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Armed Services Technical Information Agency, Arlington, Va.
FIELDS OF INTEREST OF DEPARTMENT OF DEFENSE CONTRACTORS AND OTHER NON-MILITARY ORGANIZATIONS SERVICED BY ASTIA. Sep 59, 216p.
Order from OTS $2.50 PB 161 810

The compilation is based on a special run, in mid-September 1959, of the machine-converted Field-of-Interest Registers in the ASTIA file. These registers show, in some detail, the scientific and technical fields of interest which have been approved for each of the defense contractors and other non-military organizations established to receive ASTIA's service. Part I lists the organizations alphabetically, showing the ASTIA mailing code, which is used here as a cross-reference key. Part II, which is arranged in mailing code sequence, shows the field of interest of each organizations, in the form of a grid of numbers referring to the major divisions and sections of the ASTIA distribution Guide. Part III lists the mailing codes in numerical sequence under each major division, and Part IV gives the names of divisions and sections.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
MARK I PERCEPTRON OPERATORS' MANUAL (PROJECT PARA) by John C. Hay, Ben E. Lynch and others. Rept. on Contract Nonr-2381(00). 15 Feb 60, 62p. 6 refs. Rept. no. VG-1196-G-5.
Order from LC mi$3.90, ph$10.80 PB 147 661

The Mark I Perceptron is a pattern learning and recognition device. It is intended as an experimental tool for the direct study of a limited class of perceptrons. This manual is intended primarily as a guide to the setting up and operation of the machine. It does not require extensive familiarity with the theory of perceptron systems. For those familiar with the theory, but not necessarily concerned with actually operating the machine, the manual should serve to indicate the machine's potentialities as a research instrument.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
ON THE CONVERGENCE OF REINFORCEMENT PROCEDURES IN SIMPLE PERCEPTRONS, by Frank Rosenblatt. Rept. on Proj. Para, Contract Nonr-2381(00). 15 Feb 60, 58p. 9 refs. Rept. no. VG-1196-G-4.
Order from LC mi$3.60, ph$9.30 PB 148 227

Previous reports have described a number of theoretical nerve nets called perceptrons, and have attempted to analyze their ability to associate responses to stimuli using a variety of training procedures and memory functions. Proofs have been found for a number of theorems of fundamental importance for the theory of such networks. The main findings are summarized: (1) there exist certain simple memory functions and training procedures by which it can be guaranteed that a perceptron will ultimately arrive at a solution to any given response-association problem; (2) a variety of problems are shown to be soluble; (3) the same procedures which yield solutions for binary classification problems can be employed to assign arbitrary response functions to stimuli; and (4) a considerable variety of perceptron models, differing from one another in the transfer functions of their association units, are shown to be identical with respect to their ability to arrive at solutions to learning problems.

Wharton School of Finance and Commerce, U. of Pennsylvania, Philadelphia.
POSSIBLE APPLICATIONS OF ELECTRONIC SCANNING AND COMPUTER DEVICES TO THE ANALYSIS OF GEOGRAPHIC PHENOMENA, by James P. Latham. Technical rept. no. 1 on Contract Nonr-551(29). 31 Aug 59, 27p. 16 refs. AD-227 257.
Order from LC mi$2.70, ph$4.80 PB 148 145

Methods are examined: (1) which analyze the distribution of geographic phenomena by measurement, and thereby provides an objective basis for regionalizing and describing distributions; and (2) to improve the speed, accuracy, utility, and economic feasibility of such methods by applying modern instrumented systems of measurement and data processing. The possibility and present practicability is explored of utilizing electronic scanning devices to measure and record the linear distances of the intercepts resulting when traverses sample a mapped distribution of areal units. Ways and means are developed for recording the above measurements in a manner which will permit the use of mechanical and/or electronic sorting. Computing equipment is investigated for organizing and statistically evaluating the data. (Author)

Communication Theory

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge, Mass.
REPRESENTATION OF COMPLEX SIGNALS BY MEANS OF DAMPED OSCILLATORY BASE FUNCTIONS, by Ladislav Dolansky. Scientific rept. no. 59-1 on Contract AF 19(604)4979. 10 Aug 59, 68p. 53 refs. AFCRC-TN-59-648; AD-232 538.
Order from LC mi$3.90, ph$10.80 PB 146 112

Traditionally, the more complicated communication signals have been most often expressed in terms of Fourier series components or as time functions specified at a large number of points. Such approaches are usually mathematically complete and may be useful in many respects; however, for good insight and simplicity of the associated equipment, they are often inferior to approaches using component functions more directly related to the process which generates the particular class of signals studied. An orthonormal set of decaying oscillatory base functions was obtained and the problem of expressing voiced speech sounds by means of a small number of such functions, and of obtaining their coefficients by measurement, was studied. The experimental results indicate that an analysis of the speech waveform into damped oscillatory base functions and subsequent synthesis within a good approximation is indeed possible. The essential information about each sound can be condensed into a vector or a row matrix, to which all known methods of mathematical analysis can be applied. The method is not limited to speech sounds. It can be applied to other complex experimental signals as well, although for different classes of signals different base functions may be found to be more advantageous. (Author)

Ohio State U Research Foundation, Columbus.
AN EXAMINATION OF THE SPOKEN VOCABULARY USED IN AIR TRAFFIC CONTROL, by Henry M. Moser and Robert E. Durham. Technical rept. no. 55 on Contract AF 19(604)4575. Nov 59, 39p. 13 refs. AFCRC-TN-59-73; AD-233 255.
Order from LC mi$3.00, ph$6.30 PB 146 306

Word counts were made of air traffic communications at three domestic and two international airports located in high-traffic areas in the United States. Consecutive segments of two-way radiotelephones messages were analyzed for type-token ratios. Pilots and controllers use a very limited basic vocabulary. Although there are similarities in the vocabularies employed in tower, Ground Control, and Approach Control, there are characteristic differences. In general, there are more differences between the several control facilities of one airport than among the vocabularies of the same control facility at different airports. (Author)

Speech Research Lab., U. of Michigan, Ann Arbor.
AN ACOUSTIC-PHONETIC STUDY OF INTERNAL OPEN JUNCTURE, by Ilse Lehiste. Rept. no. 2 on Contract Nonr-1224(22). Aug 59, 122p. 166 refs. AD-226 319.
Order from LC mi$6.30, ph$19.80 PB 147 690

The phonetic manifestations of internal open juncture in standard Midwestern American English were explored. Several phonetic factors were observed which indicate the presence of internal open juncture. Internal open juncture can be defined as a boundary point between 2 phonological units in English, here called bounded sequences. A bounded sequence is an ordered set of phonemes that starts with an initial allophone, ends with a final allophone, and possesses a typical intensity and duration pattern which unites the segmental phonemes into the higher-level unit. The various prejunctural and post-junctural allophones are described. The intensity pattern associated with a bounded sequence involves a rapid increase in intensity during the initial phase, followed by a slow decrease associated with deceleration in tempo during the terminal phase.

Photographic Equipment

Naval Ordnance Test Station, China Lake, Calif.
A BASIC STUDY ON IMAGE DEGRADATION RESULTING FROM VIBRATION IN A PHOTOGRAPHIC SYSTEM, by D. R. Hornbaker and R. O. White. 9 Mar 60, 24p. 1 ref. NOTS TP-2440; NAVORD rept. 7048.
Order from LC mi$2.70, ph$4.80 PB 147 491

A study to determine quantitatively the effect of simple harmonic vibration on photographic image resolution was performed. Two primary effects were found: (1) an image shift, and (2) an image smear. The first, not readily predictable, is dependent on frequency and phase as related to the exposure period. The second is readily predictable from a ratio, dependent on film resolution quality, relating image vibration amplitude to image width. (Author)

X-Ray and Crystal Analysis Lab., Pennsylvania State U., University Park.
X-RAY CAMERA FOR USE WITH UNICAM. S25 OSCILLATION GONIOMETER FOR MICROBEAM APPLICATIONS, by K. Drenck and R. Pepinsky Rept. on Contract DA 36-061-ORD-478. [1956] 8p. 3 refs. OOR rept. no. 761.4; AD-143 149.
Order from LC mi$1.80, ph$1.80 PB 147 860

A miniaturized single-crystal X-ray diffraction camera was constructed as an attachment for the Unicam . S25 oscillation-rotation goniometer. This camera is designed for use with the high-brilliance micro-focus X-ray diffraction tube.

SOCIAL SCIENCES

Documentation

Benson-Lehner Corp., Santa Monica, Calif.
A STUDY OF THE FUNDAMENTALS OF INFORMATION STORAGE AND RETRIEVAL, by Peter K. Worslet, Roger D. Dittman and others. Final rept. no. 417 on Contract Nonr-2666(00). 20 Aug 59, 99p. 2 refs.
Order from LC mi$5.40, ph$15.30 PB 147 726

The key concept is one of searching for documents not by physically shuffling and moving them to expose for inspection a reference on their surface, but rather one of allowing all of the documents to remain static and subjecting them to a paging or broadcasting system. The basic concept is one of creating a document, or document envelope, which by virtue of a sensitized coding system, would be alert rather than passive, awaiting call from a central interrogation system. It became evident that it was necessary to retreat further toward the fundamentals of Data Banking to increase the understanding of the nature of the intercommunication between human minds through documents. With this new information it was then possible to proceed to work on the technology of creating coded documents with the ability to respond to particular coded call signs. The study has contributed to the understanding of the man-document communication problem and it has contributed towards solving the extremely difficult problem of creating "alert" rather than passive documents.

Center for Documentation and Communication Research, Western Reserve U., Cleveland, Ohio.
MECHANIZED SEARCHING EXPERIMENTS USING THE WRU SEARCHING SELECTOR, by Janet Rees and Allen Kent. Technical note no. 1 on Contract AF 49(638)357. 15 May 58, 31p. 59 refs. AFOSR TN-58-445; AD-158 250.
Order from LC mi$3.00, ph$6.30 PB 146 386

One of the applications of the Western Reserve University Searching Selector is to conduct test searches on a file of encoded abstracts prepared for the American Society for Metals. This report presents typical results of pilot searches. Their evaluation as to pertinent interest and general usefulness has also been carried out by persons and organizations that originated information requests. The results of such evaluation and the procedures involved in making them are also presented. (Author)

Herner and Co., Washington, D. C.
AN EXPERIMENT IN THE DESIGN OF A NON-MANIPULATIVE CORRELATIVE INDEX, by Saul Herner and Mildred H. Heatwole. Technical note no. 2 on Contract AF 30(602)1857. 27 Apr 59, 29p. 6 refs. RADC-TN-59-169; AD-215 860.
Order from LC mi$2.70, ph$4.80 PB 147 031

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS, July 60.
Order from OTS $1.25, $10.00/year PB 161 283

Contents:
Articles:
NRL satellite solar photometry experiment, by R. W. Kreplin, T. A. Chubb, and H. Friedman
Preliminary UHF propagation predictions for Project Trade Winds III, by C. G. Purves
Scientific program:
Astronomy and Astrophysics: Atmospheric radioactivity in South America and Antartica
Chemistry: Stabilization of silicon lubricating liquids above 200°C. Force-area study of catalase films. Evaluation of creosote-resin solutions and creosote distillation fractions. Studies on the fuel-ignition-suppression capability of foam-covered aircraft runways.
Mechanics: Further verification of the significance of shock spectrum dip applicable to the design of structures
Metallurgy and Ceramics: Deoxidation of molybdenum with selected reducing agents. Stress-rupture strength of notched and unnotched metal alloy specimens in air and vacuum at 1500 F. On the protection of columbium at high temperatures
Nuclear and Atomic Physics: Photodisintegration of carbon-12 into three alpha particles. Nanosecond spark observations
Radio: Distortion reduced to acceptable value in AN/FCC-3 telegraph terminal equipment. Parasitic spiral arrays
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General

Progress report no. 54 covering the period for physics and chemistry through April 30, 1959. Massachusetts Inst. of Tech., Cambridge, Mass. May 59. Contracts AT(30-1)-2098. 165p. Order from LC. Mi $7.80, ph $25.80. AECU-4525

Biology and Medicine

Studies of nuclear debris in precipitation. Second quarterly progress report. Isotopes Inc., Westwood, N. J. Dec 59. Contract AT(30-1)-2415. 26p. Order from LC. Mi $2.70, ph $4.80. AECU-4616

Radioactive drug research. Final summary report for July 1949 to October 1959, by E. M. K. Geiling and L. J. Roth. University of Chicago, Chicago, Ill. Jan 60. Contract AT(11-1)-45. 26p. Order from LC. Mi $2.70, ph $4.80. AECU-4618

Biological effects of radiation, and related biochemical and physical studies. Semiannual progress report for period: May 1, 1959—October 31, 1959. Sloan-Kettering Inst. for Cancer Research, New York, N. Y. Contract AT(30-1)-910. 57p. Order from LC. Mi $3.60, ph $9.30. AECU-4665

Attempts to delineate inborn anemias in mice. Progress report for period January 10, 1959 to January 31, 1960, by E. S. Russell and S. E. Bernstein. Roscoe B. Jackson Memorial Lab., Bar Harbor, Me. Feb 60. Contract AT(30-1)-1800. 22p. Order from LC. Mi $2.70, ph $4.80. AECU-4689

Bone marrow activity in vitro under the influence of anemic serum and human erythropoietin, by J. S. Beck. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. May 60. Contract W-7405-eng-48. 7p. Order from OTS. 50 cents. UCRL-9205

Chemistry—General

Study of equilibrium between metals and their polyvalent chlorides in LiCl–KCl eutectic melt, by L. Yang, R. G. Hudson, and C. Chien. Carneg Institute of Tech., Metals Research Laboratory, Pittsburgh, Pa. 1959. 27p. Order from LC. Mi $2.70, ph $4.80. AECU-4544

Production of single crystal copper films at low temperatures. Technical report no. 5, by A. Yelon. Case Institute of Tech., Cleveland, Ohio. Apr 59. Contract AT(11-1)-623. 16p. Order from LC. Mi $2.40, ph $3.30. AECU-4553

Photometric titration of weak bases in nonaqueous media, by L. E. I. Hummelstedt and D. N. Hume. Massachusetts Institute of Tech., Lab. for Nuclear Science, Cambridge, Mass. 1959. Contract AT(30-1)-905. 31p. Order from LC. Mi $3.00, ph $6.30. AECU-4561

Progress report for period covering December 17, 1959 - January 15, 1960. Ionics, Inc., Cambridge, Mass. Jan 60. 4p. Order from LC. Mi $1.80, ph $1.80. AECU-4591

Absorption of organic acids on thoria. Technical report V, by H. R. Bradford and M. E. Wadsworth. University of Utah, Salt Lake City, Utah. Dec 59. Contract W-7405-eng-26. 10p. Order from LC. Mi $1.80, ph $1.80. AECU-4611

The surface chemistry of thoria. Progress report for February 1, 1959 to January 31, 1960, by H. R. Bradford and others. University of Utah, Institute of Metals and Explosives Research, Salt Lake City, Utah. Jan 60. Contract W-7405-eng-

26. 9p. Order from LC. Mi $1.80, ph $1.80. AECU-4612

Final report, January 20, 1948 - September 14, 1959, by D. Lipkin. Washington University, St. Louis, Mo. Contracts AT-29-1-GEN-77 and AT(11-1)-268. 17p. Order from LC. Mi $2.40, ph $3.30. AECU-4614

Properties of hydrided yttrium, by D. S. Parker. General Electric Co. Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. May 60. Contracts AF 33(600)-38062 and AT(11-1)-171. 23p. Order from OTS. 50 cents. APEX-558

Properties of hydrided zirconium, by D. S. Parker, and C. L. Huffine. General Electric Co., Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Dec 59. Contracts AF 33(600)-38062 and AT(11-1)-171. 38p. Order from OTS. 75 cents. APEX-561

Curves for computation of kinetics isotope effects, by G. A. Ropp. Oak Ridge National Laboratory, Oak Ridge, Tenn. Dec 59. 11p. Order from LC. Mi $2.40, ph $3.30. CF-59-12-4

Rapid two-cycle extraction method for neptunium. Initial separation as neptunium (VI) with methyl isobutyl ketone, by M. C. Elliot and J. E. Rwin. Phillips Petroleum Co., Atomic Energy Div., Idaho Falls, Idaho. Sep 59. Contract AT(10-1)-205. 12p. Order from LC. Mi $1.80, ph $1.80. IDO-14482

Mechanism of electroreduction of chromic ion at the mercury cathode, by M. E. McLain, Jr. Phillips Petroleum Co., Atomic Energy Div., Idaho Falls, Idaho. May 60. Contract AT(10-1)-205. 55p. Order from OTS. $1.50. IDO-14505

Creep of tantalum under cyclic elevated temperatures, by R. L. Hammel and R. E. Uhrig. Iowa State University of Science and Technology, Ames Laboratory, Ames, Iowa. Apr 60. Contract W-7405-eng-82. 63p. Order from OTS. $1.75. IS-125

A proposed model for high temperature creep of tantalum, by R. E. Uhrig. Iowa State University, of Science and Technology, Ames Laboratory, Ames, Iowa. May 60. Contract W-7405-eng-82. 18p. Order from OTS. 75 cents. IS-138

Photometric procedures for the analysis of nuclear reactor corrosion products, by J. R. Ciaranello and K. E. Combs. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 59. Contract W-31-109-Eng-52. 25p. Order from LC. Mi $2.70, ph $4.80. KAPL-M-JRC-2

Chemical problems of non-aqueous fluid-fuel reactors, by G. Scatchard and others. Massachusetts Inst. of Tech., Nuclear Engineering Project, Cambridge, Mass. Oct 52. Decl. Oct. 7, 1959. Contract AT(30-1)-1359. 99p. Order from LC. Mi $5.40, ph $15.30. MIT-5001

The zirconium-hydrogen system at high hydrogen contents, by G. G. Libowitz. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Jun 60. Contract AT(11-1)-GEN-8. 26p. Order from OTS. 75 cents. NAA-SR-5015

Semi-annual progress report for the period July 1959 through December 1959, by C. J. Rodden. New Brunswick Laboratory, New Brunswick, N. J. May 60. 115p. Order from OTS. $2.25. NBL-159

Contamination and decontamination properties of textile fibers with respect to I^{131}. Progress report, by A. P. Talboys and R. A. Buckingham. Johns Hopkins University, Baltimore, Md. June 52. Contract AT(30-1)-946. 20p. Order from LC. Mi $2.70, ph $4.80. NYO-4520

Investigation of spectrochemical solution-methods of analysis. The use of designed experiments and statistical methods of analysis in the interpretation of data, by J. A. Norris and R. L. McCutchen. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 36p. Order from OTS. $1.25. ORNL-2927

Reactor Chemistry Division annual progress report for period ending January 31, 1960, by W. R. Grimes and H. F. McDuffie. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 195p. Order from OTS. $3.50. ORNL-2931

Purification of beryllium compounds: A literature survey, by R. E. Moore. Oak Ridge National Laboratory, Reactor Chemistry Division, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 40p. Order from OTS. $1.00. ORNL-2938

Plastic and elastomeric materials as shielding components for nuclear reactors, by J. W. Born. B. F. Goodrich Co., Research Center, Brecksville, Ohio. July 52. Decl. Oct. 2, 1959. Contract AT(40-1)-1309. 23p. Order from LC. Mi $2.70, ph $4.80. ORO-80

Rearrangements in 3-aryl-1-butyl systems. Final report, by A. W. Fort and R. E. Leary. University of Kentucky, Lexington, Ky. Oct 59. Contract AT(40-1)-2067. 118p. Order from LC. Mi $6.00, ph $18.30. ORO-227

I. Nuclear spectroscopic studies in the heaviest element region. II. An accelerating electron spectrograph. Thesis, by R. G. Albridge, Jr. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Apr 60. Contract W-7405-eng-48. 149p. Order from OTS. $2.50. UCRL-8642

Fission and spallatin in nuclear reactions induced by heavy ions. Thesis, by G. E. Bordon. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. May 60. Contract W-7405-eng-48. 151p. Order from OTS. $2.75. UCRL-9083

Bio-organic chemistry quarterly report, for December 1959, January and February 1960, by M. Calvin and others. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Mar 60. Contract W-7405-eng-48. 52p. Order from OTS. $1.25. UCRL-9135

Longitudinal dispersion in beds of finely divided solids. Thesis, by J. M. Robinson. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. June 60. Contract W-7405-eng-48. 55p. Order from OTS. $1.25. UCRL-9193

Flame spectrophotometric determination of calcium in lead metal, by R. E. Barringer. Union Carbide Corp., Y-12 Plant, Oak Ridge, Tenn. June 60. Contract W-7405-eng-26. 21p. Order from OTS. 75 cents. Y-1295

Chemistry—Radiation and Radiochemistry

Progress report for period covering January 15, 1960 to February 15, 1960. Ionics, Inc., Cambridge, Mass. Feb 60. Contract AT(30-1)-2470. 6p. Order from LC. Mi $1.80, ph $1.80. AECU-4682

Behavior of carrier-free tracers. A bibliography of unclassified references, by M. Kahn, K. H. Jones and K. Lawson. University of New Mexico, Albuquerque, N. Mex. June 60. 127p. Order from OTS. $2.75. LA-2331UNM

Production of ionium from a pitch-blende residue, by C. W. Kuhlman, W. S. Knecht and R. D. Piper. Mallinckrodt Chemical Works, St. Louis, Mo. July 55. Decl. Nov. 23, 1959. 28p. Order from LC. Mi $2.70, ph $4.80. MCW-1379

Report for general research for December 11, 1950 to April 2, 1951. Radium volume. Mound Lab., Miamisburg, Ohio. May 51. Decl. Nov. 24, 1059. Contract AT-33-1-GEN-53. 76p. Order from LC. Mi $4.50, pn $12.30. MLM-557

Ac^{227} and Th^{228} production as a function of time for various values of neutron flux. Information report, by G. R. Grove, L. N. Russell and S. R. Orr. Mound Lab., Miamisburg, Ohio. Aug 52. Decl. Nov. 24, 1959. Contract AT-33-1-GEN-53. 11p. Order from LC. Mi $2.40, ph $3.30. MLM-747

Chemistry—Separation Processes for Plutonium and Uranium

Recovery of uranium from residues produced in hydrochlorination of nuclear fuel alloys, by T. A. Gens. Oak Ridge National Lab., Oak Ridge, Tenn. Apr 59. Contract W-7405-eng-26. 9p. Order from LC. Mi $1.80, ph $1.80. CF-59-4-9

Terminal report--design of a darex dissolution facility in ORNL Bldg. 3019 for enriched power reactor fuel elements, by R. C. Robertson. Oak Ridge National Lab., Oak Ridge, Tenn. Nov 59. 101p. Order from LC. Mi $6.00, ph $18.00. CF-59-11-26

Description of a proposed program: dynamic analysis of radiochemical plant components, by M. E. Whatley. Oak Ridge National Lab., Oak Ridge, Tenn. Dec 59. Contract W-7405-eng-26. 8p. Order from LC. Mi $1.80, ph $1.80. CF-59-12-45

Report of the chemistry and chemical engineering section for November, December 1955, January 1956, by D. H. Ahmann and others. General Electric Co. Knolls Atomic Power Laboratory, Schenectady, N. Y. Nov 56. Decl. June 18, 1960. Contract W-31-109-Eng-52. 103p. Order from OTS. $2.25. KAPL-1491

Decontamination of thorium by electrolysis a theoretical discussion, by W. N. Hansen. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Jun 60. Contract AT (11-1)-GEN-8. 20p. Order from OTS. 50 cents. NAA-SR-4885

TBP process for uranium recovery from metal waste-laboratory summary, by T. C. Runion, C. V. Ellison and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Jan 50. Decl. June 18, 1960. Contract W-7405-eng-26. 65p. Order from OTS. 50 cents. ORNL-557

Chemical Technology Division monthly progress report for December 1957. Oak Ridge National Lab., Oak Ridge, Tenn. Apr 58. Decl. November 24, 1959. Contract W-7405-eng-26. 43p. Order from LC. Mi $3.30, ph $7.80. ORNL-2468

Solubilities of selected metals in mercury: Hermex process, by A. F. Messing and O. C. Dean. Oak Ridge National Lab., Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 20p. Order from OTS. 50 cents. ORNL-2871

Fused salt fuel processing in the ORNL volatility pilot plant, by C. L. Whitmarsh and W. H. Carr. Oak Ridge National Lab., Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 42p. Order from OTS. $1.25. ORNL-2918

Controlled Thermonuclear Processes

Thermonuclear project semiannual report for period ending January 31, 1960, by A. H. Snell and others. Oak Ridge National Lab., Oak Ridge, Tenn. [nd] Contract W-7405-eng-26. 112p. Order from OTS. $2.50. ORNL-2926

Papers presented at the Controlled Thermonuclear Conference held at Washington, D. C. on February 3-5, 1958, by N. C. Christofilos and others. Controlled Thermonuclear Branch, Division of Research, United States Atomic Energy Commission, Washington, D. C. May 60. 30p. Order from OTS. 75 cents. TID-7558 (Suppl. 1)

A grazing incidence vacuum spectrograph of simple design, by R. L. Kelly. University of California. Lawrence Radiation Laboratory, Livermore, Calif. Apr 60. Contract W-7405-eng-48. 14p. Order from OTS. 50 cents. UCRL-5924-T

Bibliography-controlled thermonuclear processes LRL Berkeley 1952-1958; LRL Livermore 1953-1958, by M. R. Thomas. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Mar 59. Contract W-7405-eng-48. 25p. Order from OTS. $1.00. UCRL-9019

Criticality Studies

Critical masses of oralloy lattices immersed in water, by G. E. Hansen and others. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Mar 57. Contract W-7405-ENG-36. 56p. Order from OTS. 50 cents. LA-2026

Plutonium graphite assemblies--Part II, by A. Goodwin and C. I. Schuske. Dow Chemical Co., Rocky Flats Plant, Denver, Colo. Aug 59. Decl. December 9, 1959. Contract AT(29-1)-1108. 21p. Order from LC. Mi $2.40, ph $3.30. RFP-158

Geology and Mineralogy

Sampling the upper atmosphere for particulate matter. Quarterly progress report no. 1 for the period of June 15, to September 15, 1959, by M. Markels, Jr. and J. H. Morgenthaler. Atlantic Research Corp., Alexandria, Va. Nov 59. Contract AT(30-1)-2404. 26p. Order from LC. Mi $2.70, ph $4.80. AECU-4626

Uranium occurrences in the Mojave mining district, Kern County, California, by H. E. Nelson. Salt Lake Branch Office, AEC. Grand Junction Operations Office, Salt Lake City, Utah. Feb 57. 27p. Order from OTS. 75 cents. RME-2058

Health and Safety

Upper atmosphere monitoring program. Progress report no. 8 for May 1, 1959 through July 31, 1959, by J. Baumstark and others. General Mills, Inc., Minneapolis, Minn. Jan 60. Contract AT (11-1)-401. 43p. Order from LC. Mi $3.30, ph $7.80. AECU-4680

Summary hazards evaluation of the SMR facility, by J. D. Simpson. General Electric Co., Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Dec 59. Contracts AF 33(600)-38062 and AT (11-1)-171. 60p. Order from OTS. $1.50. APEX-536

A climatological study of the Hanford area, by D. E. Jenne and R. E. Kerns. Hanford Atomic Products Operation, Richland, Wash. Nov 59. Contract AT(45-1)-1350. 131p. Order from OTS. $2.75. HW-57722

Health physics quarterly report for October to December 1959, by R. J. Feinberg. Knolls Atomic Power Lab., Schenectady, N. Y. Jan 60. Contract W-31-109-Eng-52. 20p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-HP-3

Environmental monitoring summary for the Paducah Plant for 1959, by E. G. Brown and K. K. Mitchell chell. Union Carbide Nuclear Co., Division of Union Carbide Corp., Paducah Plant, Paducah, Ky. May 60. 7p. Order from OTS. 50 cents. KY-332

Some preliminary experiments with sodium and tetralin fires, by R. D. Keen. Atomics International Div., North American Aviation, Inc., Canoga Park, Calif. May 57. 13p. Order from LC. Mi $2.40, ph $3.30. NAA-SR-Memo-1952

Instruments

A regulated power supply for a high current magnet. Technical report no. 6, by R. B. Block. Case Institute of Technology, Cleveland, Ohio. July 59. Contract AT(11-1)-623. 30p. Order from LC. Mi $3.00, ph $6.30. AECU-4554

Present status of semiconductor particle counters, by C. A. Barnes. California Institute of Technology, W. K. Kellogg Lab. of Radiation, Pasadena, Calif. Nov 59. Contract Nonr-220(18). 8p. Order from LC. Mi $1.80, ph $1.80. AECU-4588

Unitized system of image intensifiers using fiber optics. Progress report for July to October 1959, by J. S. Kalafut. Westinghouse Electric Corp. Electronic Tube Div., Elmira, N. Y. 1959. Contract AT(30-1)-2176. 8p. Order from LC. Mi $1.80, ph $1.80. AECU-4622

High energy storage ceramic capacitor. Quarterly report no. 4 for August 19, 1957 to December 31, 1957, by D. A. Lupfer. General Electric Co. Specialty Electronic Components Dept., Auburn, N. Y. 1957. Contract AT(30-1)-1963. 73p. Order from LC. Mi $4.50, ph $12.30. AECU-4634

High energy storage ceramic capacitor. Quarterly report no. 5, for January 1, 1958 to March 31, 1958, by D. A. Lupfer. General Electric Co. Specialty Electronic Components Dept., Auburn, N. Y. 1958. Contract AT(30-1)-1963. 72p. Order from LC. Mi $4.50, ph $12.30. AECU-4635

Measurements of light transmittance through thick shielding windows, by T. W. Eckels. Argonne National Laboratory, Chemical Engineering Division, Argonne, Ill. May 60. Contract W-31-109-eng-38. 16p. Order from OTS. 50 cents. ANL-6159

Consolidated MCF-1400 oil diffusion pump, by C. E. Normand. Oak Ridge National Laboratory, Oak Ridge, Tenn. Nov 59. 18p. Order from LC. Mi $2.40, ph $3.30. CF-59-11-70

Line voltage and noise monitor, by T. J. Boland. Phillips Petroleum Co. Atomic Energy Division, Idaho Operations Office, Idaho Falls, Idaho. June 60. Contract AT(10-1)-205. 20p. Order from OTS. 50 cents. IDO-16608

A linear scanner for numan radioisotope research, by A. C. Morris, Jr. Oak Ridge Institute of Nuclear Studies, Medical Division, Oak Ridge, Tenn. Mar 60. Contract AT-40-1-Gen-33. 26p. Order from OTS. 75 cents. ORINS-33

The angular distribution of alpha particles emitted by oriented Np^{237} nuclei, by S. H. Hanauer and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 76p. Order from OTS. $2.25. ORNL-2919

Determination of certification intervals for standard resistors and precision potentiometers, by L. H. Bressan. Sandia Corporation, Albuquerque, N. Mex. June 60. 15p. Order from OTS. 50 cents. SCR-206

Metallurgy and Ceramics

Thermodynamic properties of carbides at high temperatures. Annual report and renewal proposal, by S. Fujishiro and N. A. Gokeen. University of Pennsylvania, Philadelphia, Pa. Sep 59. 8p. Order from LC. Mi $1.80, ph $1.80. AECU-4346

Using ceramics and cermets in nuclear power reactors, by G. L. Ploetz. Knolls Atomic Power Laboratory, Schenectady, N. Y. [nd.] 21p. Order from LC. Mi $2.40, ph $3.30. AECU-4354

A fundamental study of grain boundary phenomena in ceramic materials. Status report no. 1 for the period June 15, 1958 to March 1, 1959. Materials Research Corp., Yonkers, N. Y. 1959. Contract AT(30-1)-2178. 17p. Order from LC. Mi $2.40, ph $3.30. AECU-4364

The determination of the equilibrium phase diagram, zirconium-niobium, by C. E. Lundin. University of Denver, Denver Research Institute, Denver, Colo. Oct 59. Contract AT(11-1)-752. 8p. Order from LC. Mi $1.80, ph $1.80. AECU-4402

Mechanical fabrication of rare earth metals, by K. M. Bohlander. General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio. Nov 59. 24p. Order from LC. Mi $2.70, ph $4.80. AECU-4425

Refining and purification of rare-earth metals, by C. L. Huffine and J. M. Williams. General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio. Nov 59. 32p. Order from LC. Mi $3.00, ph $6.30. AECU-4426

Uranium dioxide technology: A literature survey interim report, by D. E. Johnson and F. H. Lofftus. General Atomic Division, General Dynamics Corp., San Diego, Calif. May 58. Addendum, by D. E. Johnson, July 58. 22p. Order from LC. Mi $2.40, ph $3.30. AECU-4488

Study of factors influencing ductility of iron--aluminum alloys, Monthly progress report no. 8, by F. C. Perkins and J. F. Nachman. University of Denver, Denver Research Institute, Denver, Colo. Dec 59. Contract AT(11-1)-742. 9p. Order from LC. Mi $1.80, ph $1.80. AECU-4528

Melting point of Th-U-C fuel elements, by L. Brewer. General Atomic Division, General Dynamics Corp., San Diego, Calif. Aug 59. Contract AT(04-3)-314. 4p. Order from LC. Mi $1.80, ph $1.80. AECU-4535

Thermal cycling of EBR-1, Mark III fuel, by G. K. Whitham and E. S. Sowa. Argonne National Laboratory, Argonne, Ill. Apr 60. Contract W-31-109-eng-38. 25p. Order from OTS. 75 cents. ANL-6028

Metallurgy Division annual report for 1959, by F. G. Foote and others. Argonne National Laboratory, Argonne, Ill. 1959. Contract W-31-109-eng-38. 170p. Order from OTS. $2.75. ANL-6099

The diffusion of gold in gamma uranium, by S. J. Rothman. Argonne National Laboratory, Metallurgy Division, Argonne, Ill. May 60. Contract W-31-109-eng-38. 18p. Order from OTS. 50 cents. ANL-6127

Protective coatings for high-temperature metal alloys, by C. G. Harman and others. Battelle Memorial Institute, Columbus, Ohio. Dec 52. Decl. November 20, 1959. Contract W-7405-eng-92. 23p. Order from LC. Mi $2.70, ph $4.80. BMI-804

Further development of gas-pressure bonding of Zircaloy-clad flat-plate uranium dioxide fuel elements, by S. J. Paprocki and others. Battelle Memorial Institute, Columbus, Ohio. May 60. Contrcct W-7405-eng-92. 57p. Order from OTS. $1.50. BMI-1436

Development of corrosion-resistant niobium-base alloys, by D. J. Maykuth and others. Battelle Memorial Institute, Columbus, Ohio. May 60. Contract W-7405-eng-92. 89p. Order from OTS. $2.00. BMI-1437

Fluidized-bed coating of UO_2 powder with niobium and other elements, by J. M. Blocher, Jr. and others. Battelle Memorial Institute, Columbus, Ohio. May 60. Contract W-7405-eng-92. 54p. Order from OTS. $1.50. BMI-1440

An evaluation of data on nuclear carbides, by F. A. Rough and W. Chubb. Battelle Memorial Institute, Columbus, Ohio. May 60. Contract W-7405-eng-92. 100p. Order from OTS. $2.25. BMI-1441

Apparatus for the study of fission-gas release from neutron-activated fueled graphite, by H. S. Rosenberg and others. Battelle Memorial Institute, Columbus, Ohio. June 60. Contract W-7405-eng-92. 8p. Order from OTS. 50 cents. BMI-1444

Minutes of conference on hydrogen in uranium held at Battelle Memorial Institute, June 11, 1954, by C. R. Tipton, Jr. Battelle Memorial Institute, Columbus, Ohio. July 54. Decl. December 2, 1959. 23p. Order from LC. Mi $2.70, ph $4.80. BMI-X-126

Zirconium diboride, boron nitride, and boron carbide compatibility with austenitic stainless steel, by J. H. Cherubini and C. F. Leitten, Jr. Oak Ridge, National Laboratory, Oak Ridge, Tenn. July 59. Contract W-7405-eng-26. 19p. Order from LC. Mi $2.40, ph $3.30. CF-59-7-1

Improved bolting materials for intennal assembly of HRP components, by B. D. Draper. Oak Ridge National Laboratory, Oak Ridge, Tenn. Oct 59. 10p. Order from LC. Mi $1.80, ph $1.80. CF-59-10-69

Sintering mechanism as applied to refractory oxides. A bibliography, 1955–1959, by D. R. Wilder. Iowa State University, Ames Laboratory, Ames, Iowa. Jan 60. Contract W-7405-eng-82. 51p. Order from OTS. $1.25. ISC-288(Suppl. II)

Compilation of calculated data useful in predicting metallurgical behavior of the elements in binary alloy systems, by E. Teatum and others. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. June 60. Contract W-7405-ENG-36. 225p. Order from OTS. $3.50. LA-2345

Bibliography on tungsten, its alloys and compounds, by L. E. Godfrey, P. E. Bell and H. S. Stearns. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. June 60. Contract W-7405-ENG-36. 208p. Order from OTS. $3.50. LAMS-2401 (Vol. 1)

Bibliography on tungsten, its alloys and compounds, by L. E. Godfrey, P. E. Bell, and H. S. Stearns. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. June 60. Contract W-7405-ENG-36. 432p. Order from OTS. $3.50. LAMS-2401 (Vol. 2)

Properties of ceramic and cermet fuels for sodium graphite reactors, by N. R. Koenig and B. A. Webb. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 50p. Order from OTS. $1.50. NAA-SR-3880

Engineering evaluation of a mixed alloy fuel element irradiated at elevated temperatures in the SRE, by J. L. Ballif, B. R. Hayward and J. W. Walter. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 84p. Order from OTS. $2.25. NAA-SR-3888

The permeation of hydrogen through hastelloy B, by D. W. Rudd, D. W. Vose and J. B. Vetrano. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 17p. Order from OTS. 75 cents. NAA-SR-4898

Dispersion fuels for advanced organic moderated reactor, by J. Kroehler, Jr. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 44p. Order from OTS. $1.25. NAA-SR-5018

Carbide fuel development: Phase 1 report for period of May 15 to September 15, 1959, by A Strasser and others. Nuclear Development Corporation of America, White Plains, N. Y. and The Carborundum Company, Niagara Falls, N. Y. Oct 59. Contract AT(30-1)-2303. 100p. Order from OTS. $2.50. NDA-2140-2

Diffusion annealing as a means of improving corrosion resistance of Zircaloy-2 clad, uranium-2^{w}/o zirconium rods, by R. G. Jenkins. Nuclear Metals, Inc., Concord, Mass. Apr 60. Contract AT(30-1)-1565. 70p. Order from OTS. $1.75. NMI-1217

Beryllium-clad uranium elements, fabrication development by multi-temperature extrusion, and dimensional stability on thermal cycling, by J. Greenspan. Nuclear Metals, Inc., Concord, Mass. Mar 60. Contract AT(30-1)-1565. 41p. Order from OTS. $1.00. NMI-1219

Multi-temperature extrusions, by E. S. Guidoboni, I. B. Roll and P. Loewenstein. Nuclear Metals, Inc., Concrrd, Mass. Mar 60. Contract AT (30-1)-1565. 49p. Order from OTS. $1.25. NMI-1229

Interdiffusion in Zircaloy-2 clad U-2^{w}/o Zr fuel materials and its effects upon corrosion behavior, by A. L. Geary. Nuclear Metals, Inc., Concord, Mass. Mar 60. Contract AT(30-1)-1565. ,27p. Order from OTS. 50 cents. NMI-1233

Magnetic determination of impurities in uranium fuel slugs, by D. Whal and A. Liboff. Atomic Energy Division, Sylvania Electric Products, Inc., Bayside, N. Y. June 56. Decl. May 18, 1960. Contract AT-30-1-GEN-366. 21p. Order from OTS. 35 cents. SEP-167

The terminal report on the fabrication of hollow cylindrical fuel elements, by J. Fugardi and R. E. King. Atomic Energy Division, Sylvania Electric Products Inc., Bayside, N. Y. Feb 56. Decl. May 17, 1960. 22p. Order from OTS. 30 cents. SEP-187

Metallographic techniques of U-base alloys, by J. Gross. Atomic Energy Division, Sylvania Electric Products, Inc., Bayside, N. Y. Feb 56. Decl. May 18, 1960. Contract AT-30-1-Gen-366. 11p. Order from OTS. 25 cents. SEP-188

A study of the hydride process for producing thorium powder, by R. H. Witt, J. Nylin, and N. M. McCullough. Atomic Energy Division, Sylvania Electric Products, Inc., Bayside, N. Y. Aug 56. Decl. May 19, 1960. 30p. Order from OTS. 35 cents. SEP-221

Dimensional instability of uranium - I. First annual progress report for June 30th, 1955 to June 30th, 1956, by R. Resnick and L. Seigle. Atomic Energy Division, Sylvania Electric Products, Inc., Bayside, N. Y. June 56. Decl. May 23, 1960. Contract AT-30-1-GEN-366. 22p. Order from OTS. 30 cents. SEP-228

Metallographic techniques for bond study of aluminum-clad nickel-plated uranium fuel elements, by H. W. Woods. Atomic Energy Division, Sylvania Electric Products, Inc., Bayside, N. Y. Mar 57. Decl. May 19, 1960. Contract AT-30-1-GEN-366. 11p. Order from OTS. 25 cents. SEP-238

Welding and brazing. A literature search, by T. F. Davis. AEC Technical Information Service Extension, Oak Ridge, Tenn. Feb 60. 100p. Order from OTS. $2.50. TID-3546

Slip casting of nuclear fuel elements. Report no. III, by G. J. Comstock and others. Stevens Institute of Technology, Powder Metallurgy Laboratory, Hoboken, N. J. May 60. Contract AT(30-1)-2258. 11p. Order from OTS. 50 cents. TID-5629

Development of boron-bearing materials for application as lumped burnable poisons, by D. Jaffe, E. E. F. Losco, and S. F. Kaufman. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa. May 60. Contract AT-11-1-GEN-14. 64p. Order from OTS. $1.75. WAPD-221

Halogen additions to inert-atmosphere weld chambers, by R. L. Matchett and W. L. Frankhouser. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa. May 60. Contract AT-11-1-GEN-14. 18p. Order from OTS. 75 cents. WAPD-223

Minutes--AEC welding committee meeting Oak Ridge National Laboratory February 2 and 3, 1953. Technical Information Service, Oak Ridge, Tenn. 1953. Decl. March 17, 1960. 159p. Order from OTS. 70 cents. WASH-143

Nuclear fuels newsletter, by E. Epremian. Division of Research, Washington, D. C. Aug 57. Decl. May 10, 1960. 38p. Order from OTS. 40 cents. WASH-703

Uranium alloy newsletter, by E. Epremian. Division of Research, Washington, D. C. [nd.] Decl. May 23, 1960. 25p. Order from OTS. 35 cents. WASH-700

Effect of annealing time and working on indicated thickness of uranium, by R. B. Burditt. Union Carbide Nuclear Co., Division of Union Carbide Corporation, Y-12 Plant, Oak Ridge, Tenn. Dec 59. Contract W-7405-eng-26. 13p. Order from OTS. 75 cents. T-1293

Particle Accelerators and High-Voltage Machines

Electron model of a spiral sector accelerator, by D. W. Kerst and others. Midwestern Universities Research Association, Madison, Wis. [nd.] 136p. Order from OTS. $2.75. MURA-559

Computational results pertaining to use of a time-dependent magnetic field perturbation to implement injection or extraction in a ffag synchrotron by use of the $\nu_r = N/3$ resonance, by L. J. Laslett and K. R. Symon. Midwestern Universities Research Association, Madison, Wis. Mar 60. Contract AT(11-1)-384. 70p. Order from OTS. $2.00. MURA-561

Alternative formulations of magnetostatic problems, by R. S. Christian and S. C. Snowdon. Midwestern Universities Research Association, Madison, Wis. Apr 60. Contract AT(11-1)-384. 11p. Order from OTS. 50 cents. MURA-568

Physics and Mathematics

The imaginary part of the optical potential, by L. C. Gomes. Rio de Janeiro. Centro Brasileiro de Pesquisas Fsicas and Massachusetts Institute of Technology, Laboratory for Nuclear Science, Cambridge, Mass. 1959. Contract AT(30-1)-2098. 13p. Order from LC. Mi $2.40, ph $3.30 AECU-4365

Nuclear interactions in carbon produced by cosmic rays with energies between 10^{10} and 10^{12} ev, by L. F. Hansen and W. B. Fretter. University of California, Berkeley, Calif. Dec 59. Contract Nonr-222(40). 45p. Order from LC. Mi $3.00, ph $6.30. AECU-4566

Publications for 1959. University of Pennsylvania, Philadelphia, Pa. 1959. Contract AT(30-1)-2202. 116p. Order from LC. Mi $6.00, ph $18.30. AECU-4604

Technical progress report. Part I. High-speed computer program. Part II. Mathematical methods.

Part III. Illiac use and operation. Part IV. IBM 650 use and operation. Part V. General laboratory information. University of Illinois, Digital Computer Lab., Urbana, Ill. Sep 59. Contract AT(11-1)-415 and Nonr-1834(15). 23p. Order from LC. Mi $2.70, ph $4.80. AECU-4615

Radioisotope X-ray generator. Quarterly progress report no. 2 covering the period from October 1, 1959 to December 31, 1959, by M. W. Chisholm, R. J. Lambert and J. Kastner. Picker X-Ray Corp. Picker Research Center, Cleveland, Ohio. 1959. Contract AT(11-1)-746. 20p. Order from LC. Mi $2.40, ph $3.30. AECU-4632

The design and uses of high flux research and test reactors, by J. A. Lane. Oak Ridge National Laboratory, Oak Ridge, Tenn. 1959. Contract W-7405-eng-26. 39p. Order from LC. Mi $3.00, ph $6.30. AECU-4650

Theory of pion scattering and photoproduction, by G. F. Chew. University of Illinois. Urbana, Ill. and Institute for Advanced Study, Princeton, N.J. 1956. 150p. Order from LC. Mi $7.20, ph $22.80. AECU-4664

Studies of reactor containment. Monthly technical progress report no. 32 covering period December 1, 1959 through December 31, 1959, by T. A. Zaker. Illinois Institute of Technology, Armour Research Foundation, Chicago, Ill. Jan 60. Contract AT(11-1)-528. 4p. Order from LC. Mi $1.80, ph $1.80. AECU-4675

A crystallographic least squares refinement program for the IBM 704: Identification PS XR3, by V. Vand and R. Pepinsky. Pennsylvania State University, Crystal Research Lab., and Groth Institute, University Park, Pa. Oct 59. Contract N60nr-26916; AF49(638)-416 and AT(30-1)-1516. 140p. Order from LC. Mi $6.90, ph $21.30. AECU-4678

Proceedings of the conference on the physics of breeding October 19-21, 1959. Argonne National Laboratory, Lemont, Illinois. 1959. 399p. Order from OTS. $6.00. ANL-6122

Heat transfer in thermal radiation absorbing and scattering media, by R. Viskanta. Argonne National Laboratory, Argonne, Ill. May 60. Contract W-31-109-eng-38. 187p. Order from OTS. $3.00. ANL-6170

Two-group constants for reactor materials, by M. J. Stanley. Aircraft Nuclear Propulsion Department General Electric Co., Cincinnati, Ohio. May 58. Decl. November 4, 1959. Contracts AF33(038)-21102 and AT(11-1)171. 61p. Order from OTS. $1.50. APEX-369

Finite cylinder gamma heating program (Monte Carlo Research Series), by General Electric Co. Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. May 58. Contracts AF 33(600)-38062 and AT(11-1)-171. 18p. Order from OTS. 75 cents. APEX-552

High-temperature hydraulic rod control. General Electric Co. Aircraft Nuclear Propulsion Department, Light Military Electronics Department, Cincinnati, Ohio. May 60. Contracts AF 33(600)-38062 and AT(11-1)-171. 92p. Order from OTS. $2.25. APEX-556

Liquid metal fuel reactor experiment. Quarterly Technical report for October to December 1958. The Babcock and Wilcox Company, Atomic Energy Division, Lynchburg, Va. 1958. Contract AT (30-1)-1940. 139p. Order from OTS. $2.75. BAW-1135

Liquid metal fuel reactor experiment. Critical experiment, report of experimental data, by T. C. Engelder and others. The Babcock and Wilcox Company, Critical Experiment Laboratory, Lynchburg, Va. Mar 60. Contract AT(30-1)-1940. 73p. Order from OTS. $2.00. BAW-1185

A method for measuring the U^{239} fission cross section, by M. Clark. Brookhaven National Laboratory, Associated Universities, Inc., Upton, N. Y. June 52. Decl. April 13, 1960. 21p. Order from OTS. 30 cents. BNL-205

A study of the wind profile in the lowest 400 feet of the atmosphere. Progress report no. 5 for October 16, 1959 to January 15, 1960, by I. A. Singer. Brokkhaven National Laboratory, Upton, N. Y. 1960. 43p. Order from OTS. $1.50. BNL-596 (T-170)

Sodium component study. Combustion Engineering, Inc., Nuclear Components Engineering Dept., Chattanooga, Tenn. Feb 59. Contract AT(11-1)-665. 292p. Order from LC. Mi $11.10, ph $45.00. CENC-1038

Temperature distribution in thin walled heat-exchangers having non-circular flow passages, by W. S. Farmer. Oak Ridge National Laboratory, Oak Ridge, Tenn. Oct 51. Decl. with deletions February 19, 1957. 15p. Order from LC. Mi $2.40, ph $3.30. CF-51-10-178(Del.)

Basic inelastic neutron data for age calculations for various fuel and moderator compositions, by C. M. Copenhaver. Oak Ridge, National Laboratory, Oak Ridge, Tenn. June 6956. Decl. with deletions March 15, 1957. Contract W-7405-eng-26. 14p. Order from LC. Mi $2.40, ph $3.30. CF-56-6-40(Del.)

Present and proposed methods for calculating absorption and radial divergence corrections for diffraction line contours from debyescherrer powder patterns, by J. M. Carter and F. J. Musil. Goodyear Atomic Corp., Portsmouth, Ohio. Oct 59. Contract AT(33-2)-1. 43p. Order from LC. Mi $3.30, ph $7.80. GAT-T-689

The detection of freon leaks in converters by infrared methods, by D. L. Scott. Goodyear Atomic Corp., Portsmouth, Ohio. Dec 59. Contract AT(33-2)-1. 17p. Order from LC. Mi $2.40, ph $3.30. GAT-T-707

Water loss rates following a piping failure in the PRTR, by T. W. Ambrose. Hanford Atomic Products Operation, Richland, Wash. Feb 60. Contract AT(45-1)-1350. 21p. Order from OTS. 75 cents. HW-60654 REV-2

Equations of state for steamwater mixtures and some representative applications analysis, by W. J. Love. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Nov 59. Contract AT(45-1)-1350. 20p. Order from LC. Mi $2.40, ph $3.30. HW-62858

Coordinates for semi-rigid molecules, by H. L. McMurry. Phillips Petroleum Co., Atomic Energy Division, Idaho Falls, Idaho. May 60. Contract AT(10-1)-205. 31p. Order from OTS. $1.00. IDO-16600

Materials testing reactor. Engineering test reactor technical branches. Quarterly report for October 1 to December 31, 1959, by J. R. Huffman and others. Phillips Petroleum Co., Atomic Energy Division, Idaho Falls, Idaho. May 60. Contract AT(10-1)-205. 65p. Order from OTS. $2.00. IDO-16620

Tram, a Monte Carlo thermal neutron code for the IBM 704, by M. A. Martino and W. W. Stone. General Electric Co., Knolls Atomic Power Laboratory, Schenectady, N. Y. June 59. Contract W-31-109-eng-52. 33p. Order from OTS. $1.75. KAPL-2039

Long term irradiation of natural dysprosium, by E. C. Hansen. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 59. Contract W-31-109-Eng-52. 22p. Order from LC. Mi $2.70, ph $4.80. KAPL-M-ECH-2

Isotopic shielded poison burnout, by E. L. Wachspress. Knolls Atomic Power Lab., Schenectady, N. Y. Nov 59. Contract W-31-109-Eng-52. 7p. Order from LC. Mi $1.80, ph $1.80. KAPL-M-ELW-10

Increasing convergence rates by transforming the multigroup operator--application to one space dimension problems, by E. L. Wachspress. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 59. Contract W-31-109-Eng-52. 12p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-ELW-11

A variational procedure for obtaining spatially dependent thermal spectra, by G. P. Calame and P. D. Federighi. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 59. 44p. Order from LC. Mi $3.30, ph $7.80. KAPL-M-GPC-2

Some asymptotic results for a coverage problem, by M. Halperin. Knolls Atomic Power Lab., Schenectady, N. Y. Sep 59. Contract W-31-109-Eng-52. 23p. Order from LC. Mi $2.70, ph $4.80. KAPL-M-MH-2

Performance and evaluation of natural circulation power plants, by M. M. Schorr. Knolls Atomic Power Lab., Schenectady, N. Y. Dec 59. Contract W-31-109-Eng-52. 48p. Order from LC. Mi $3.30, ph $7.80. KAPL-M-NPA-1

Jet pump test for NCR application, by M. Nazar and R. Eisenstadt. Knolls Atomic Power Lab., Schenectady, N. Y. Jan 60. Contract W-31-109-Eng-52. 63p. Order from LC. Mi $3.90, ph $10.80. KAPL-M-NPA-4

Numerical solution of transient and steady-state neutron transport problems, by B. Carlson. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. May 59. Contract W-7405-eng-36. 30p. Order from LC. Mi $2.60, ph $3.30. LA-2260

Collision integrals and transport properties for gases obeying an exponential repulsive potential. Application to hydrogen and helium, by J. B. Mann. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. June 60. Contract W-7405-ENG-36. 58p. Order from OTS. $1.75. LA-2383

Solution of a problem to obtain the optimum energy for a rocket initially in a circular orbit, by G. A. Baker, Jr. and J. G. Wills. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. July 60. Contract W-7405-ENG-36. 20p. Order from OTS. 75 cents. LAMS-2403

The structure of certain finite difference schemes, by B. Wendroff. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. June 60. Contract W-7405-ENG-36. 11p. Order from OTS. 50 cents. LA-2410

Study of slightly-enriched uranium-water lattices with high conversion ratio. Quarterly progress report for August 1, 1959, to October 31, 1959, by Combustion Engineering, Inc., Nuclear Div., Windsor, Conn. May 60. Contract AT(30-1)-2379. 59p. Order from OTS. $1.50. NYO-2702

Nuclear data processing on an IBM-704 computer with the Condac program, by C. D. Goodman and B. D. Williams. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 27p. Order from OTS. $1.00. ORNL-2925

High energy nuclear reactions. A literature search, by J. Hudis. Brookhaven National Laboratory, Upton, N. Y. Mar 60. 40p. Order from OTS. $1.00. TID-3901

Ionic mass transport by free convection to horizontal electrodes. Thesis, by E. J. Fenech. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Apr 60. Contract W-7405-eng-48. 81p. Order from OTS. $2.25. UCRL-9079

Microscope equipment for nuclear emulsion analysis, by J. C. Hodges. University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Feb 60. Contract W-7405-eng-48. 132p. Order from OTS. $2.75. UCRL-9089

Some nuclear and electronic ground-state properties of Pa^{233}, Am^{241}, and 16-hr Am^{242}. Thesis, by J. Winocur. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Apr 60. Contract W-7405-eng-48. 128p. Order from OTS. $2.50. UCRL-9174

Relativistic and diamagnetic corrections of atomic g values, by I. P. K. Lindgren. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. May 60. Contract W-7405-eng-48. 31p. Order from OTS. 75 cents. UCRL-9184

SN5001--An IBM-650 code for steady-state thermal evaluation of an instrumented multi-fuel-plate subassembly, by E. Arbtin and R. B. Westphal. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa. Apr 60. Contract AT-11-1-GEN-14. 21p. Order from OTS. 75 cents. WAPD-TM-146

Calculation of thermal neutron fluxes in primary shields, by D. C. Anderson and K. Shure. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa. Nov 59. Contract AT-11-1-GEN-14. 41p. Order from OTS. $1.25. WAPD-TM-193

ABRAC - an IBM-704 three dimensional nuclear-thermal depletion program with distributed void effects, by W. M. Jacobi and others. Westinghouse Electric Corp., Bettis Atomic Power Lab., Pittsburgh, Pa. Mar 60. Contract AT-11-1-GEN-14. 130p. Order from OTS. $2.75. WAPD-TM-203

Euripus-3 and daedalus--Monte Carlo density codes for the IBM-704, by H. J. Amster, H. G. Kuehn and J. Spanier. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa. Feb 60. Contract AT-11-1-GEN-14. 91p. Order from OTS. $2.25. WAPD-TM-205

An experiment to measure effective delayed neutron fractions, by S. Kaplan and A. F. Henry. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa. Feb 60. Contract AT-11-1-GEN-14. 29p. Order from OTS. $1.00. WAPD-TM-209

A dimensional analysis of the departure from nucleate boiling heat flux in forced convection, by P. Griffith. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh Pa. Dec 59. Contract AT-11-1-GEN-14. 25p. Order from OTS. 75 cents. WAPD-TM-210

Temp-2 a one dimensional transient thermal stress program for the IBM-704, by L. M. Culpepper and D. Jortner. Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa. Apr 60. Contract AT-11-1-GEN-14. 17p. Order from OTS. 50 cents. WAPD-TM-214

*Reports to the AEC Nuclear Cross Sections Advisory Group, Washington, D. C. April 28-29, 1960, by J. A. Harvey. Oak Ridge National Laboratory, Oak Ridge, Tenn. 1960. 74p. Order from OTS. $2.25. WASH-1028

Radiation Effects on Materials

Effects of irradiation on some corrosion-resistant fuel alloys, by J. H. Kittel and K. F. Smith. Argonne National Laboratory, Argonne, Ill. May 60. Contract W-31-109-eng-38. 18p. Order from OTS. 50 cents. ANL-5640

A study of the effects of fission fragment recoils on the oxidation of zirconium, by W. C. Yee. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 90p. Order from OTS. $2.50. ORNL-2742

Radioactive Waste

Effect of atomic interaction potential on defect production in metals, by E. Brown and G. H. Goedecke. Rensselaer Polytechnic Institute, Troy, N. Y. 195?. Contract AT(30-1)-1995. 11p. Order from LC. Mi $2.40, ph $3.30. AECU-4564

Capacity test data for the adsorption of volatile ruthenium on silica gel, by D. R. Anderson and D. W. Rhodes. Phillips Petroleum Co., Atomic Petroleum Co., Atomic Energy Division, Idaho Falls, Idaho. June 60. Contract AT(10-1)-205. 22p. Order from OTS. 75 cents. IDO-14510

Winchester Laboratory, quarterly report for January 1, 1960 to March 31, 1960, by A. C. Herrington. National Lead Company, Inc., Winchester Laboratory, Winchester, Mass. 1960. Contract AT(49-6)-924. 38p. Order from OTS. 75 cents. WIN-116

Reactors—General

Fate of fission product gases in the coolant stream, by L. Brewer. General Atomic Division, General Dynamics Corp., San Diego, Calif. Aug 59. Contract AT(04-3)-314. 3p. Order from LC. Mi $1.80, ph $1.80. AECU-4536

Vaporization processes in a runaway reactor, by L. Brewer. General Atomic Division, General Dynamics Corp., San Diego, Calif. Aug 59. Contract AT(04-3)-314. 5p. Order from LC. Mi $1.80, ph $1.80. AECU-4539

The helium cooled loop in the GETR, by R. F. Hausman. General Electric Co., Atomic Equipment Dept., San Jose, Calif. 1959? 11p. Order from LC. Mi $2.40, ph $3.30. AECU-4621

Initial testing and operation of the Argonne low power reactor (ALPR), by E. E. Hamer. Argonne National Laboratory, Argonne, Ill. Dec 59. Contract W-31-109-eng-38. 261p. Order from OTS. $4.00. ANL-6084

The internal feedback of EBR-I Mark-III, by J. C. Carter. Argonne National Laboratory, Argonne Ill. Feb 60. Contract W-31-109-eng-38. 72p. Order from OTS. $2.00. ANL-6124

Studies of reactor containment. Summary report no. 2 for August 1, 1959 to January 31, 1960, by T. A. Zaker. Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill. Feb 60. Contract AT(11-1)-528. 80p. Order from OTS. $2.25. ARF-4132-13

The BMI-16 recirculating gas loop installed at the ETR, by J. V. Baum and others. Battelle Memorial Institute, Columbus, Ohio. Mar 60. Contract W-7405-eng-92. 43p. Order from OTS. $1.50. BMI-1429

Industrial chemical production by chemo-nuclear processes with special reference to the production of fixed nitrogen, by G. Lellouche and M. Steinberg. Brookhaven National Laboratory, Upton, N. Y. Sep 59. 59p. Order from OTS. $2.00. BNL-574 (T-157)

Metal-water reactions: V. The kinetics of metal-water reactions -- low pressure studies, by S. C. Furman. General Electric Co., Vallecitos Atomic Laboratory, Atomic Power Equipment Dept., Pleasanton, Calif. July 59. Contract AT(04-3)-189. 64p. Order from OTS. $1.75. GEAP-3208

Metal-water reactions: VII. Reactor safety aspects of metal-water reactions, by L. F. Epstein. General Electric Company, Vallecitos Atomic Laboratory, Atomic Power Equipment Dept., Pleasanton, Calif. Jan 60. Contract AT(04-3)-189. 73p. Order from OTS. $2.00. GEAP-3335

Status report on control rod materials research and development program, by C. G. Andre and others. General Electric Co., Vallecitos Atomic Laboratory, Atomic Power Equipment Dept., Pleasanton, Calif. Feb 60. Contract AT(04-3)-189. 55p. Order from OTS. $1.50. GEAP-3355

The MTR/ETR safeguard committee, by R. J. Nertney. Phillips Petroleum Company. Atomic Energy Division, Idaho Falls, Idaho. Apr 60. Contract AT(10-1)-205. 12p. Order from OTS. 50 cents. IDO-16569

Safeguard report on the proposed method of annealing graphite in the X-10 reactor, by L. E. Stanford. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 146p. Order from OTS. $3.00. ORNL-2725

Effect of heat flux on the corrosion of aluminum by water. Part I. Experimental equipment and preliminary test results, by J. C. Griess and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 44p. Order from OTS. $1.50. ORNL-2939

Reactors—Power

Experimental gas cooled reactor. Preliminary proposal, by Henry J. Kaiser Company Kaiser Engineers Division, Oakland, Calif. and Allis-Chalmers Manufacturing Company, Nuclear Power Department, Washington, D. C. Aug 59. Contract AT(10-1)-925. 150p. Order from OTS. $4.00. AECU-4701(Pt. 1)

Annual report for February 1958 to February 1959. Prepared by ALCO Products Ind. Staff, Ft. Belvoir, Va. ALCO Products, Inc., Schenectady, N. Y. June 1959. Contract AT(30-3)-326. 74p. Order from OTS. $2.00. APAE-47

Liquid metal fuel reactor experiment. Nonnuclear instrumentation for liquid bismuth service, by B. L. Birch. Babcock and Wilcox Company, Lynchburg, Va. Apr 60. Contract AT(30-1)-1940. 32p. Order from OTS. $1.75. BAW-1069

Liquid metal fuel reactor experiment. Investigation and testing of welded and brazed molybdenum joints. Final report, by R. E. Pavlak. The Babcock and Wilcox Company, Lynchburg, Va. Apr 60. Contract AT(30-1)-1940. 38p. Order from OTS. $1.25. BAW-1098

Maritime gas-cooled reactor program. Quarterly progress report for the period ending June 30, 1959, by S. A. Bernsen and others. General Dynamics Corporation, General Atomic and Electric Boat Division, San Diego, Calif. 1959. Contract AT(04-3)-187. 180p. Order from OTS. $3.50. GD-1099

Corrosion of beryllium in flowing sodium, by W. W. Kendall. General Electric Company. Atomic Power Equipment Department, Schenectady, N. Y. Jan 60. Contract AT(04-3)-189 PA#6. 27p. Order from OTS. $1.00. GEAP-3333

Exponential pile measurements with hollow slugs in graphite-uranium lattices, by E. D. Clayton and others. Hanford Atomic Pooducts Operation, Richland, Wash. Apr 55. Decl. June 17, 1960. Contract W-31-109-Eng-32. 32p. Order from OTS. 35 cents. HW-36174

ETR cycle 18 thermal and fast neutron flux measurements, by L. D. Weber and C. H. Hogg. Phillips Petroleum Co. Atomic Energy Division, Idaho Operations Office, Idaho Falls, Idaho. June 60. Contract AT(10-1)-205. 49p. Order from OTS. $1.00. IDO-16563

Thermal performance of the SRE main intermediate heat exchanger, by K. W. Foster. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 66p. Order from OTS. $1.50. NAA-SR-3775

OMRE fuel plate surface temperature measurement, by S. Sudar. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. May 60. Contract AT(11-1)-GEN-8. 38p. Order from OTS. $1.25. NAA-SR-4047

Piqua prototype handling system, by H. Nadler. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. May 60. Contract AT(11-1)-GEN-8. 94p. Order from OTS. $2.25. NAA-SR-4361

Hydraulic characteristics of HNPF preliminary design fuel elements, by S. Sudar and D. Rosh. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. May 60. Contract AT(11-1)-GEN-8. 31p. Order from OTS. $1.00. NAA-SR-4385

Dielectric properties of terphenyl mixtures, by R. J. Sullivan and F. C. Silvey. Atomics International A Division of North American Aviation, Inc., Canoga Park, Calif. May 60. Contract AT(11-1)-GEN-8. 17p. Order from OTS. 75 cents. NAA-SR-4764

Plutonium-Enriched OMR cores, by T. J. Connolly. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. May 60. Contract AT(11-1)-GEN-8. 45p. Order from OTS. $1.25. NAA-SR-4812

OMR degasifier loop experiment, by G. W. Corporales and P. R. Benson. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. May 60. Contract AT(11-1)-GEN-8. 44p. Order from OTS. $1.25. NAA-SR-4886

Feasibility study on centrifuge enrichment of the by-pass stream of the pebble bed reactor, by H. M. Parker and J. Mowat. University of Virginia, Research Laboratories for the Engineering Sciences, Charlottesville, Va. Nov 59. Contract AT(30-1)-2207. 25p. Order from OTS. 75 cents. NYO-2707

Gas-cooled reactor project. Quarterly progress report for period ending March 31, 1960, by Staff of Oak Ridge National Laboratory, Oak Ridge, Tenn. 1960. Contract W-7405-eng-26. 255p. Order from OTS. $3.50. ORNL-2929

Technology—Feed Materials

The influence of lubrication on the compactability of magnesium-green salt blends for bomb reduction, by S. J. Paprocki, R. J. Carlson, and E. G. S Smith, Jr. Battelle Memorial Institute, Columbus, Ohio. June 57. Decl. May 16, 1960. Contract W-7405-eng-92. 14p. Order from OTS. 30 cents. BMI-1193

Studies relating to hydrogen in dingot uranium, by M. J. Trzeciak and M. W. Mallett. Battelle Memorial Institute, Columbus, Ohio. Sep 57. Decl. May 16, 1960. Contract W-7405-eng-92. 32p. Order from OTS. 65 cents. BMI-1225

Process development quarterly report, Part II, by N. E. Berry and others. Mallinckrodt Chemical Works, St. Louis, Mo. Feb 56. Decl. June 18, 1960. Contract W-14-108-eng-8. 181p. Order from OTS. $2.75. MCW-1383

Process development quarterly report. Part I, Laboratory work, by B. Elliott and others. Mallinckrodt Chemical Works, St. Louis, Mo. July 57. Decl. June 18, 1960. Contract W-14-108-eng-8. 202p. Order from OTS. $3.00. MWM-1403

Process development quarterly report. Part I, Laboratory work, by B. Elliott and others. Mallinckrodt Chemical Works, St. Louis, Mo. Oct 57. Decl. June 18, 1960. Contract W-14-108-eng-8. 118p. Order from OTS. 70 cents. MCW-1407

Process development quarterly report. Part II, Pilot Plant Work, by B. Elliott and others. Mallinckrodt Chemical Works, St. Louis, Mo. Nov 57. Decl. May 31, 1960. Contract W-14-108-eng-8. 80p. Order from OTS. $1.50. MCW-1409

Green salt moving bed process, by R. W. LeGassie and others. New Brunswick Laboratory, New Brunswick, N. J. June 55. Decl. June 17, 1960. 66p. Order from OTS. 50 cents. NBL-105

Process development quarterly report, Part I, by A. E. Rueyle and J. U. Shepardson. Mallinckrodt Chemical Works, St. Louis, Mo. July 53. Decl. June 18, 1960. Contract W-14-108-Eng-8. 54p. Order from OTS. 45 cents. NYO-1355

Technology—Raw Materials

Controlled pH stripping of uranium from amines, by D. J. Crouse. Oak Ridge National Laboratory, Chemical Techn logy Division, Chemical Development Section C, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 23p. Order from OTS. 75 cents. ORNL-2941